BANGALORE WATER SUPPLY
AND
SEWERAGE BOARD

CAUVERY BHAVAN, KEMPEGOWDA ROAD,
BANGALORE – 560 009

ITEMWAR TENDER FOR THE WORK OF

Name of the Work: ***Work of providing and laying 100, 150, 200 mm dia water supply line to improve water supply facilities to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE 5 sub division.***

(Through e-procurement portal only)

http://www.kppp.karnataka.gov.in

Office of the Executive Engineer,
BANGALORE WATER SUPPLY & SEWERAGE BOARD
SOUTH-EAST-2 DIVISION,
2 nd floor, 11th main, 35th cross, 4th T block, Bangalore-560041
Telephone – 080 22945389
e-mail – eese-2@bwssb.gov.in

TENDER REFERENCE :	:	BWSSB /EESE-2/TO/PB/2946 / 2024-25 Dated:22.01.2025	
PERIOD OF SALE OF TENDER DOCUMENT	:	From:24.01.2025	From:31.01.2025
LAST DATE FOR SALE OF TENDER DOCUMENT	:	Dt:31.01.2025	
LAST DATE AND TIME FOR RECEIPT OF TENDERS	:	31.01.2025 upto 16.00 hrs	
PLACE OF OPENING OF TENDER	:	Office of the Executive Engineer, Water Supply & Sanitary Division(South East-2), 2 nd floor, 11th main,35th cross, 4th T block, Bangalore-560041.	
TIME AND DATE OF OPENING OF TENDERS	:	03.02.2025 after 16.30hrs	
ADDRESS FOR COMMUNICATION	:	Office of the Executive Engineer, Water Supply & Sanitary Division(South East-2), 2 nd floor, 11th main,35th cross, 4th T block, Bangalore-560041. Telephone – 080 22945389 e-mail – eese-2@bwssb.gov.in	

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SECTION 1:

BANGALORE WATER SUPPLY AND SEWERAGE BOARD

Office of the Executive Engineer, Water Supply & Sanitary Division(South-East-2),
35th cross, 11th main, 4th T block, Jayanagar,Bangalore-41

INVITATION FOR TENDER – SHORT TERM
(ONLY THROUGH E-PROCUREMENT PORTAL)
www.kppp.karnataka.gov.in

IFT No/ BWSSB / EE(SE-2) / TO/PB / 2946 / 2024-25
Dated:22.01.2025

For and on behalf of the Bangalore Water Supply and Sewerage Board, **SHORT TERM ITEMWAR TENDER is** invited through e-procurement process with tender procedure in line with Rule 28 of the KTPP Act by the Executive Engineer, Water Supply and Sanitary Division (South-East-2), 35th cross,11th main, 4th T block, Jayanagar, Bangalore-560041 for the following work from registered Agencies of appropriate class as indicated against each work of **BWSSB/KUWSDB/KPWD,** etc. Who are having adequate financial resources, past experience in similar nature of work possessing valid VAT registration. The Board keeps the right of acceptance or rejection of any tender without assigning any reasons.

The Tenderers are required to pay the **Earnest Money Deposit only through e-procurement portal** only using any of the four modes.

1. (1)Credit Card (Online Payment) (2) Direct Debit Using Internet Banking (Online Payment) (3) Remittance at the Bank Counter - Challan (Offline Payment) (4) NEFT (Offline payment). The details regarding their capability to undertake the tender (as detailed in ITT Clause 4) and the price tender shall be uploaded in the website. Technical details will be opened on the date and time mentioned in ITT clause 5 and evaluated. The price tender of the Tenderer, who is found to be qualified to execute the tendered works, will be opened on the date notified later. The Tenderers are advised to note the minimum qualification criteria specified in Clause 3 of the Instructions to Tenderers to qualify for award of the contract.

2. Tender documents may be downloaded from www.kppp.karnataka.gov.in website only. Interested tenderers may obtain further information at the same address.

3. Additional information related to e-procurement process can be obtained through the above mentioned website or contact e-procurement helpdesk No.**080-2550 1216 / 2550 1227**. The

electronic tender comprising Technical and Financial bids will be operated as Single stage Tender system.

4. Bidders can access tender documents from www.kppp.karnataka.gov.in website only and upload the required details; those are mentioned in different sections in the bid document in to electronic tender on the website. Scanned documents those are required to be furnished as per Section 2, 3 & 4 of the bid document shall be submitted through e- procurement.

5. The Tender processing fee once paid will not be refunded.

6. The tender will be uploaded in the e-procurement website on **24.01.2025** and Last date and time for Receipt of tenders will be on **31.01.2025** upto **16:00** Hrs and the date of opening of tender will be on **03.02.2025** after **16.30** Hrs.

Sl. No.	**Name of work**	**Amount put to tender**	**Earnest Money Deposit @ 2.00%**	**Tender Processessing fee**	**Period of Completion of work**	**Clause of tender**	**Eligibility of tenderer**
1	Work of providing and laying 100, 150, 200 mm dia water supply line to improve water supply facilities to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE- 5 sub division.**CALL-3**	Rs. 1,16,81,513/- (Exclusive of GST) Rs.98,99,587 /-(Exclusive of GST)	Rs.1,98,000/-	As per KTPP act	06 Months	KW-3 Two cover	As per KTPP act

The Eligibility criterion for the above works is as follows:

1. The tender is based on Two Cover System
2. Contractors should have registration in BWSSB or KPWD/KUWSDB, etc as per KTPP act. Those who does not have BWSSB registration can also participate in the tender provided they should get registered in the Board in case the tender is awarded before the issue of Work Order.
3. Assessed available tender capacity = (A*N*2.5-B)
4. Form of tender is mandatory to upload in e-procurement portal

5. Within 20 Days of the receipt of the letter of acceptance, the successful tenderer shall deliver to the employer a Security deposit in any of the forms given below. **For an amount equivalent to 5% of the contract price plus additional security for unbalanced tenders in accordance with clause 25.5 of ITT & clause 44 of the conditions of contract for all works** from a Nationalized / Scheduled Indian Bank, with jurisdiction at Bangalore as specified.

6. **Qualification Information :-**
   a. Profit & Loss Statement certified by Chartered accounted for a minimum period of Two Years upload in **KPPP** portal
   b. Existing commitments on going Works upload in **KPPP** portal
   c. Works for which tenders already submitted upload in **KPPP** portal
   d. ITR for a Minimum period of Two financial years upload in **KPPP** portal.

7. Applications / requisitions from joint venture Firms are not acceptable.

8. Bangalore Water Supply and Sewerage Board (BWSSB) reserve the right to cancel or annul the entire or part of this process of invitation at any time without assigning any reason.

9. For any additional information regarding the above tender, the firms who are interested to quote, may contact office of the undersigned at the office address given below on all working days during office hours (10:30 hours to 17:00 hours).

10. List of documents to support qualification of bidder is to be uploaded to the e-procurement website www.kppp.karnataka.gov.in

11. Bidders shall submit offers that comply with the requirements of the bid document, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered. The attention of the bidders is drawn to clause 23 regarding the rejection of the bids, which are not substantially responsive to the requirement of the bid document.

12. Other details can be seen in the tender documents.

13. The tenderer should have in the last 5 years period achieved in atleast two financial years an average annual financial turnover of rupees not less than the estimated cost **ie. Rs. 116.81 lakhs**

along with Balance sheet,Profit & loss statement,UDIN issued by Registered Charted accountant with GST.

14. The tender should have satisfactorily completed one similar work to an extent of 50% of the cost the works **ie., Rs. 58.41lakhs with GST.**

15. Liquid assests or availability of credit facilities should be 30% of the amount of the contract **Rs. 34.04 lakhs with GST.**

16. The tender should have executed in any one year the following minimum quantities of works usually 80% of the annual requirement i.e., **100mm dia DI pipe and above for a length 1623 Rmt,150mm dia DI pipe and above for a length 836 Rmt and 200mm dia DI pipe and above for a length 276 Rmt in continuous 12 months**

17. As per GO No.FD55 Pro-Cell 2004, Bangalore Dt: 17.02.2005, the expenditure on the employment of the quality supervision consultants will be charged to the cost of works and goods and equipment's under procurement, also take action as per circular No. BWSSB/EIC/CE (M)/ACE (M)-I/DCE (M)-II/TA(M)-I/2012/17-18 dt:03.07.2017, further action will be taken to recover the cost of the above in the contract bills..

18. The works to be executed in accordance with the contract documents and to carry out all the works as per the guidelines in the "Draft Safety Manual for construction and maintenance of UGD Lines and septic tanks in Urban Areas -2013". Any lapses in following the safety guidelines, the contractor/ agency/firm will be held solely responsible.

19. The rates considered in the tender are based on CSR & is exclusive of GST.

20. Road cutting machine should be used mandatorily for cutting the approved width of road while executing the work.

21. Section-3,clause 1.5 A & B is mandatory to be uploaded

Further details may be had from this office during the office hours on all working days.

Corrigendum/Addendum/Modification/corrections, if any, will be published in the Web site only.

Executive Engineer
Water Supply & Sanitary Division(SE-2)
2nd floor, 35th cross, 11th main,4th 'T' block
Jayanagar, Bangalore-5600041
Phone: 080-22945389.

SECTION 2:

INSTRUCTIONS TO TENDERERS (ITT)

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3. Qualification of the Tenderer
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5. NA
6. NA

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7. Content of Tender documents
8. NA
9. Amendment of Tender documents

C. Preparation of Tenders

10. Documents comprising the Tender
11. Tender prices
12. Tender validity
13. Earnest money deposit
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31 Corrupt or Fraudulent Practices

A. General

1. Scope of Tender

1.1 The ***Executive Engineer (South-East-2), BWSSB,*** (Referred to as Employer in these documents) invites tenders following **Two Cover e-procurement procedure**, from eligible Tenderers, for the construction of work (as defined in these documents and referred to as "the work") detailed in the Table given in the Invitation for Tenders (IFT).

2. Eligible Tenderers

2.1 Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Karnataka

2.2 Tenders from Joint ventures are not acceptable.

3. Qualification of the Tenderer:

3.1 All Tenderers shall provide the requested information accurately and in sufficient detail in Section 3: Qualification information.

3.2 To qualify for award of this contract, each Tenderer in its name should have in the last five years i.e. 2019-20 to 2023-24)

3.3 (a) & (b) Deleted : NA

3.4 To qualify for a package of contracts made up of this and other contracts for which tenders are invited in this IFT, the Tenderer must demonstrate having experience and resources to meet the aggregate of the qualifying criteria for the individual contracts.

3.5 Sub-contractors’ experience and resources shall not be taken into account in determining the Tenderers compliance with the qualifying criteria except to the extent stated in 3.2 (d) and (e) above.

3.6 Tenderers who meet the above specified minimum qualifying criteria, will only be qualified, if their available tender capacity is more than the total tender value. The available tender capacity will be calculated as under:

Assessed available tender capacity = (A*N*2.5 - B)

where

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to 2019-20 to 2023-24price level) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which tenders are invited.

B = Value, at 2019-20 to 2023-24price level, of existing commitments and on-going works to be completed during the next **1** years (period of completion of the works for which Tenders are invited)*

Note: The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Employer in charge, not below the rank of an Executive Engineer or equivalent.

c.Form of Tender is mandatory

3.7 Even though the Tenderers meet the above criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
- participated in the previous Tender for the same work and had quoted unreasonably high tender prices and could not furnish rational justification.

4. One Tender per Tenderer: NA

5. Cost of Tendering: NA

6. Site visit: NA

B. Tender documents

7. Content of Tender documents

7.1 The set of tender documents shall have all the Sections given in Page 2:

7.2 Both the sets should be completed and returned with the tender.

8. Clarification of Tender Documents

8.1 NA

8.2 Pre-tender meeting:

8.2.1 NA

8.2.2 NA

8.2.3 NA

8.2.4 NA

8.2.5 NA

9. Amendment of Tender documents

9.1 Before the deadline for submission of tenders, the Employer may modify the tender documents by issuing addenda.

9.2 Any addendum thus issued shall be part of the tender documents and shall be communicated in writing or by cable to all the purchasers of the tender documents.

9.3 To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their tenders, the Employer shall extend as necessary the deadline for submission of tenders, in accordance with Sub-Clause 16.2 below.

C. Preparation of Tenders

10. Documents comprising the Tender

10.1 The tender submitted in e-procurement portal by the Tenderer shall contain the documents as follows:

(a) Scanned copy of Earnest Money Deposit;
(b) Scanned copies of Qualification Information as per formats given in Section 3;
(c) The Tender (in the format indicated in Section 4)
(d) Priced Bill of Quantities (Section 9);

and any other materials required to be completed and submitted by Tenderers in accordance with these instructions. The documents listed under Sections 3, 4, 6 and 9 shall be filled in without exception. The Earnest Money Deposit shall be submitted to the Tender inviting authority on or before the time of submission mentioned in IFT. PHOTOCOPIES OF THE DOCUEMNTS SHOULD BE NOTARISED.

10.2 NA

11. Tender prices

11.1 The contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill of Quantities submitted by the Tenderer.

11.2 The bidder shall fill in the unit rates in figures for all items of the Works described in the Bill of Quantities. The system will automatically convert the unit rates mentioned in figures to words and also calculate the amount of that item as well as the total Bid value. *Items for which no rate is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates in the Bill of Quantities*

11.3 All duties, taxes, and other levies payable by the contractor under the contract, or for any other cause, shall be included in the rates, prices and total Tender Price submitted by the Tenderer.

Note: *"Bidders may like to ascertain availability of excise/custom duty exemption benefits available in India to the contracts financed under World Bank loan/credits. They are solely responsible for obtaining such benefits which they have considered in their bid and in case of failure to receive such benefits for reasons whatsoever, the employer will not compensate the bidder (contractor). Where the bidder has quoted taking into account such benefits, he must give all information required for issue of certificates in terms of such notifications as per form attached to the Qualification Information in the bid. To the extent the employer determines the quantity indicated therein are* *reasonable keeping in view the bill of quantities, construction programme and methodology, the certificates will be issued within 60 [sixty] days of signing of contract and no subsequent changes will be permitted. No certificate will be issued for items where no quantity/capacity of equipment is indicated in the statement. The bids which do not conform to the above provisions will be treated as non responsive and rejected. Any delay in procurement of the construction equipment /machinery/goods as a result of the above shall not be a cause for granting any extension of time."*

11.4 The rates and prices quoted by the Tenderer shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

12. Tender validity

12.1 Tenders shall remain valid for a period not less than **ninety days** after the deadline date for tender submission specified in Clause 16. A tender valid for a shorter period shall be rejected by the Employer as non-responsive.

12.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the Tenderers may extend the period of validity for a specified additional period. The request and the Tenderers' responses shall be made in writing or by cable or e-mail. A Tenderer may refuse the request without forfeiting his earnest money deposit. A Tenderer agreeing to the request will not be required or permitted to modify his tender, but will be required to extend the validity of his earnest money deposit for a period of the extension, and in compliance with Clause 13 in all respects.

13. Earnest money deposit

13.1 The Tenderer shall furnish, as part of his tender, earnest money deposit in the amount as shown in column 4 of the Table of IFT for this particular work. (As mentioned in e procurement portal)

13.2 Instruments having fixed validity issued as earnest money deposit for the tender shall be valid for 45 days beyond the validity of the tender.

13.3 Any tender not accompanied by an acceptable earnest money deposit and not secured as indicated in Sub-Clauses 13.1 and 13.2 above shall be rejected by the Employer as non-responsive.

13.4 The earnest money deposit of unsuccessful Tenderers will be returned within 30 days of the end of the tender validity period specified in Sub-Clause 12.1.

13.5 The earnest money deposit of the successful Tenderer will be discharged when the Tenderer has signed the Agreement and furnished the required Performance Security.

13.6 The earnest money deposit may be forfeited:

(a) if the Tenderer withdraws the Tender after tender opening during the period of tender validity;

(b) if the Tenderer does not accept the correction of the Tender Price, pursuant to Clause 24; or

(c) in the case of a successful Tenderer, if the Tenderer fails within the specified time limit to
    (i) sign the Agreement; or
    (ii) furnish the required Security deposit

14. Format and signing of Tender

14.1 The completed bid comprising of documents indicated in ITB 12, should be uploaded in the e procurement portal along with scanned copies of requisite certificates those are mentioned in different sections in the bid document and scanned copy of Bid Security / EMD in case it is provided in the form of Credit Card (Online Payment) 2) Direct Debit Using Internet Banking (Online Payment) 3) Remittance at the Bank Counter - Challan (Offline Payment) (4) NEFT (Offline payment). 14.2

14.3 Deleted

D. Submission of Tenders

15. Up-loading & submission of tenders

15.1 The tenders should be uploaded only through www.kppp.karnataka.gov.in. Tender should contain

A. Technical Tender consisting of following:

a. All the documents with required details in prescribed format; those are mentioned in different sections in the Tender. Form of Tender, Declaration statement regarding Customs/ Excise duty exemption for materials/construction equipment brought to site as mentioned in Section 2, etc., shall be downloaded, filled with required details, signed, scanned & uploaded to the e-tender website https://www.kppp.karnataka.gov.inon or before the time and date indicated in notification /Section I IFT.

b. **Tender security.** As per E procurement portal

The above documents along with notarized copies of documentary evidences as indicated in Section—II ITT, Section-III Qualification information & Section IV Forms of Tender shall be scanned and uploaded to the website compulsorily, failing which tender will be rejected in view of incomplete bid document and

B. Financial Tender consisting of Bill of Quantities (file name: BOQ.xls). *The tenderer shall down load the bill of quantities and key in the rates (in figures only) in the Bill of Quantities sheet and upload the same file on to the website on or before the time and date indicated in notification /Section I IFT.*

Scanned copy of Bid security provided in the form of Banker's cheque/ Demand draft/Pay Order, is to be uploaded to the E procurement portal (giving details on the name and package to which Bid is submitted)

NOTE:

1. URL of the Website for tender submission through e-tender & Address for submission of Hard copy of Tender security are as follows:

i https://www.kppp.karnataka.gov.in.

ii **Executive Engineer (South-East)-2,**
Bangalore Water Supply and Sewerage Board,
2nd floor, 11th main,35th cross,4th 'T' block, Jayanagar, Bangalore-5600041

2.The details related to submission of tenders, downloading / uploading of documents or other details are available online in the help wizard, Vendor manual & FAQ of above website. The same is provided along with sample formats in Annexure-I of the Bid document for ready reference.

15.2 Deleted

15.3 Unique Identification Number will be automatically generated by the server with time -stamp and sent to the account of the bidder as an acknowledgement after bidder finally uploads the bids.

15.4 Deleted

16. Deadline for submission of the Tenders

16.1 Tenders must be received by the Employer at the address specified above no later than . In the event of the specified date for the submission of tenders being declared a holiday for the Employer, the tenders will be received up to the appointed time on the next working day.

16.2 The Employer may extend the deadline for submission of tenders by issuing an amendment in accordance with Clause 9, in which case all rights and obligations of the Employer and the Tenderers previously subject to the original deadline will then be subject to the new deadline.

17. Late Tenders

17.1 Any Tender received by the Employer after the deadline prescribed in Clause 16
will be returned unopened to the Tenderer

17.2 The software of E procurement portal will not allow the Bidder to upload the documents after expiration of the stipulated date & time of Bid submission. Employer will not be responsible for non-receipt of bids on the stipulated date & time prescribed in clause 16, due to Internet Problems, improper uploading or any other related problems. In case of connectivity problems, Tenderer may contact Helpdesk of the e procurement portal office at MS building, Bangalore and may also draw the attention of tender inviting authority.

18. Modification and Withdrawal of Tenders

18.1 Tenderers may "modify" and "withdraw" their tenders multiple numbers of times, until the deadline for submission of tenders by operating the relevant provision made in e-tendering. If the Tenderer withdraws the tender before the deadline for submission of tenders and later if he is interested to submit the tender once again, may do so within the stipulated date & time as mentioned in Clause 16. In this case within the stipulated date & time, the tenderer can once again submit the requisition to the officer inviting tenders for access to the withdrawn tender document for resubmission. For this tenderer need not make any additional payment towards the cost of tender document. Communication of modification / withdrawal by other means will not be accepted.

18.2 Deleted.

18.3 No Tender may be modified after the deadline for submission of Tenders.

18.4 Withdrawal or modification of a Tender between the deadline for submission of Tenders and the expiration of the original period of Tender validity specified in Clause 12.1 above or as extended pursuant to Clause 12.2 may result in the forfeiture of the earnest money deposit pursuant to Clause 13.

18.5 Tenderers may offer discounts for individual items by simply modifying the quoted unit price in the Bill of Quantities. Also, Tenderer may enter their overall discount, at specified location in the Bill of Quantities only, by submitting tender modifications in accordance with this clause. Communication of discount by other means will not be accepted.

E. Tender opening and evaluation

19. Opening of Technical portion of Tenders and evaluation to determine qualified Tenderers:

19.1 The Employer will open the Technical details of all the Tenders received (except those withdrawn), including modifications made pursuant to Clause 18, in the presence of the Tenderers or their representatives who choose to attend at ***17:00*** hours on the date and the place specified in Clause 16. In the event of the specified date of Tender opening being declared a holiday for the Employer, the Tenders will be opened at the appointed time and location on the next working day.

19.2 WITHDRAWAL proposal submitted pursuant to clause 18 shall be read out first and their bids shall not be opened.

19.3 The Tenderers names, the presence or absence of earnest money deposit (amount, format and validity), the submission of qualification information and such other information as the Employer may consider appropriate will be announced by the Employer at the opening.

19.4 The Employer shall prepare minutes of the Tender opening, including the information disclosed to those present in accordance with Sub-Clause 19.3.

19.5 The Price Tenders of all the Tenderers including modifications for Financial tenders cannot be opened as this is programmed to open later after evaluation of the Technical details of the participating Tenderers.

19.6 The Employer will evaluate and determine whether each tender (a) meets the eligibility criteria defined in ITT Clause 2; (b) is accompanied by the required earnest money deposit as per stipulations in ITT Clause and (c) meets the minimum qualification criteria stipulated in ITT Clause 3. The Employer will draw out a list of qualified Tenderers.

20. Opening of Price Tender of qualified Tenderers and evaluation:

20.1 NA

20.2 NA

20.3 NA

20.4 NA

21. Process to be confidential

21.1 Information relating to the examination, clarification, evaluation, and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process until the award to the successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of his Tender.

22 Clarifications of Tenders

22.1 To assist in the examination, evaluation, and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for clarification of his Tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Tender shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Tenders in accordance with Clause 24.

22.2 Subject to sub-clause 22.1, no Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, it should do so in writing.

22.3 Any effort by the Tenderer to influence the Employer in the Employer's Tender evaluation, Tender comparison or contract award decisions may result in the rejection of the Tenderers' Tender.

23. Examination of Tenders and determination of responsiveness

23.1 Prior to the detailed evaluation of Tenders, the Employer will determine whether each Tender; (a) has been properly signed; and; (b) is substantially responsive to the requirements of the Tender documents like [(a)Form of Tender, (b)Declaration statement regarding Customs/ Excise duty exemption for materials/ construction equipment brought to site as mentioned in Section 2 etc.,] Scanned / uploaded [including documents those are required to be furnished as per Section 2, 3 & 4 of the tender,]; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the tendering documents.

23.2 A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Tender documents, the Employer's rights or the Tenderer's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Tenderers presenting substantially responsive Tenders.

23.3 If a Tender is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

24. Correction of errors

24.1 (a) Once the Tenderer key in the rates in figures, in the Bill of quantities provided, rate in words will be auto generated by the system.

(b) Once the Tenderer key in the rates in figures, in the Bill of quantities provided, the system will automatically calculate the amount of that item as well as the total Bid value.

24.2 Deleted

25. Evaluation and comparison of Tenders

25.1 The Employer will evaluate and compare only the Tenders determined to be substantially responsive in accordance with Clause 23.

25.2 In evaluating the Tenders, the Employer will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows:

(a) making any correction for errors pursuant to Clause 24; and

(b) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub Clause 18.5.

25.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Tender evaluation.

25.4 NA

25.5 NA

F. Award of Contract

26. Award criteria

26.1 Subject to Clause 27, the Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price, provided that such Tenderer has been determined to be (a) eligible in accordance with the provisions of Clause 2, and (b) qualified in accordance with the provisions of Clause 3.

27. Employer's right to accept any Tender and to reject any or all Tenders

27.1 Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for the Employer's action.

28. Notification of award and signing of Agreement

28.1 The Tenderer whose Tender has been accepted will be notified of the award by the Employer prior to expiration of the Tender validity period by cable, telex, e-mail or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

28.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of Security deposit in accordance with the provisions of Clause 29.

28.3 The Agreement will incorporate all agreements between the Employer and the successful Tenderer. It will be kept ready for signature of the successful Tenderer in the office of Employer within 30 days following the notification of award along with the Letter of Acceptance. Within 20 days of receipt, the successful Tenderer will sign the Agreement and deliver it to the Employer.

28.4 Upon the furnishing by the successful Tenderer of the Performance Security, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful.

29. Security deposit

29.1 Within 20 days of receipt of the Letter of Acceptance, the successful Tenderer shall deliver to the Employer a Security deposit in any of the forms given below for an amount equivalent to 5% of the Contract price plus additional security for unbalanced tenders in accordance with Clause 25.5 of ITT and Clause 44 of the Conditions of Contract. :

- Cash or

- Banker's cheque/Demand draft,/Pay Order in favour of ***Chairman, BWSSB*** payable at ***Bangalore*** or

- A bank guarantee in the form given in Section 10; or

29.2 If the security deposit is provided by the successful Tenderer in the form of a Bank Guarantee, it shall be issued either by a Nationalized/Scheduled bank.

29.3 The security deposit if furnished in cash or demand draft can, if requested, be converted to interest bearing securities at the cost of the contractor.

29.4 Failure of the successful Tenderer to comply with the requirements of Sub-Clause 29.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Earnest money deposit.

30 Advance Payment and Security: NA

31. Corrupt or Fraudulent practices

31.1 The GOK requires that the Tenderers/Suppliers/Contractors, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, GOK :

(a) will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(b) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a GOK contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a GOK contract.

31.2 Furthermore, Tenderers shall be aware of the provision stated in sub-clause 50.2 of the Conditions of Contract.

SECTION 3:

QUALIFICATION INFORMATION

Qualification Information

The information to be filled in by the Tenderer hereunder will be used for purposes of computing Tender capacity as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

1.1 Constitution or legal status of Tenderer [*Attach copy*]

Place of Registration

____

[*Attach copy*]

Principal place of business:

____

1.2 Total value of civil engineering construction works executed and payments received in the last five years (in Rs. Lakhs)[14]

2019– 20______________

2020– 21______________

2021– 22______________

2022– 23______________

2023– 24______________

1.3 Deleted

1.4 Deleted

1.5 Information on works for which Tenders have been submitted and works which are yet to be completed as on the date of this Tender.

(A) Existing commitments and on-going works:

Description of Work	Place& State	Contract No. & Date	Name and Address of Employer	Value of Contract (Rs. lakhs)	Stipulated period of completion	Value of works[15] remaining to be completed (Rs. lakhs)	Anticipated date of completion
1	2	3	4	5	6	7	8

(B) **Works for which Tenders already submitted:**

Descripti	Plac	Name	Estimate	Stipulate	when	Remar

14

15

on of Work	e & State	and Address of Employer	d value of works (Rs. lakhs)	d Date period of completion	decision is expected	ks if any
1	2	3	4	5	6	7

1.6 Deleted.

1.7 Deleted
1.8 Deleted
1.9. Name, address, and telephone, telex, and fax numbers of the Tenderers' bankers who may provide references if contacted by the Employer.
1.10 Deleted

BANKER’S CERTIFICATE

Deleted

1.11 Deleted.
1.12 Deleted
1.13 Deleted

SECTION 4;

TABLE OF FORMS:

- **FORM OF TENDER**
- **QUALIFICATION INFORMATION**
- **LETTER OF ACCEPTANCE**
- **NOTICE TO PROCEED WITH THE WORK**
- **AGREEMENT FORM.**

Form of Tender

Description of the Works:	Tender for the Work of providing and laying 100, 150, 200 mm dia water supply line to improve water supply facilities to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE 5 sub division.

To
The Executive Engineer (South-East)-2,
Bangalore Water Supply and Sewerage Board,
2nd floor, 35th cross ,11th main,4th 'T' block
Jayanagar,Bangalore-560041.

GENTLEMEN,

We offer to execute the Works described above in accordance with the Conditions of Contract accompanying this Tender for the Contract Price of ____________ [in figures] (____) [in letters].[1]

This Tender and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any Tender you receive.

The advance payment required is Rs…..............................

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We hereby confirm that this Tender complies with the Tender validity and Earnest money deposit required by the Tender documents.

We attach herewith our current income-tax clearance certificate.

Yours faithfully,

Authorized Signature:

Name & Title of Signatory: ____

---

[1] To be filled in by the Tenderer, together with his particulars and date of submission at the bottom of the Form of Tender

Name of Tenderer ____
Address: ---

Letter of Acceptance

(letterhead paper of the Employer)
________________________[date]

To:

____
[name and address of the Contractor]

Dear Sirs,

This is to notify you that your Tender dated ____________ for execution of the ____ _________ [name of the contract and identification number, as given in the Instructions to Tenderers] for the Contract Price of Rupees —— ____ (_____________) [amount in words and figures], as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by our Agency.

You are hereby requested to furnish Security deposit plus additional security for unbalanced tenders in terms of Clause 25.5 of ITT, in the form detailed in Clause 29.1 of ITT for an amount of Rs.————— within 20 days of the receipt of this letter of acceptance valid up to 30 days from the date of expiry of Defects Liability Period i.e. up to .... and sign the contract, failing which action as stated in Para 29.4 of ITT will be taken.

Yours faithfully,

Authorized Signature
Name and Title of Signatory
Name of Agency

Issue of Notice to proceed with the work

(letterhead of the Employer)
————— (date)
To
——————————————— (name and address of the Contractor)
———————————————
———————————————

Dear Sir:

Pursuant to your furnishing the requisite security deposit as stipulated in ITT Clause 29.1 and signing of the contract agreement for the construction of ——————[name of the contract] a Tender Price of Rs. ——————, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory authorized to sign on behalf of Employer)

Agreement Form

Agreement

This agreement, made the ____________day of ________20_______, between____ __________________[name and address of Employer] (hereinafter called "the Employer") of the one part and _______________________ ______________________ ____ __ ____[name and address of contractor] (hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous that the Contractor execute ____________________________ ____ ____[name and identification number of Contract] (hereinafter called "the Works") and the Employer has accepted the Tender by the Contractor for the execution and completion of such Works and the remedying of any defects therein at a contract price of Rupees.............................

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:
   - i) Letter of Acceptance;
   - ii) Notice to proceed with the works;
   - iii) Contractor's Tender;
   - iv) Contract Data;
   - v) Conditions of contract (including Special Conditions of Contract);
   - vi) Specifications;
   - vii) Drawings;
   - viii) Bill of Quantities; and
   - ix) Any other document listed in the Contract Data as forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of ____
was hereunto affixed in the presence of:
Signed, Sealed and Delivered by the said ____

____

in the presence of:
Binding Signature of Employer ____
Binding Signature of Contractor ____

BANKER'S CERTIFICATE

This is to certify that M/s. .... is a reputed company with a good financial standing. If the contract for this work, namely .... (name of the work) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. .... to meet the working capital requirements for executing the above contract

Sd/-
Name of the Bank, Senior Bank Manger
Address:...................................

1.11 Proposals for subcontracting components of works amounting to more than 20% of the contract price .

Item of Work	Value of Sub-Contract	Identified Sub-Contractor (Name and address)	Experience of similar work [2]

1.12 Information on litigations in which the Tenderer is involved:

Other Party (ies)	Employer	Details of dispute	Amount involved	Remarks showing present status

1.13 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

---

[2] Attach Certificate from the respective Employers (scanned & Uploaded)

SECTION 5:

CONDITIONS OF CONTRACT

Conditions of Contract

A. General

1. Definitions

1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Bold letters are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Tender.

Compensation events are those defined in Clause 38 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Employer in accordance with Sub Clause 46.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Tender to carry out the Works has been accepted by the Employer.

The **Contractor's Tender** is the completed Tender document submitted by the Contractor to the Employer.

The **Contract price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; months are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects liability period** is the period named in the Contract Data and calculated from the Completion Date.

The **Employer** is the party who will employ the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Employer by issuing an extension of time.

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works.

Plant is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** is the area defined as such in the Contract Data.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Employer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

A **Variation** is an instruction given by the Employer which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Employer will provide instructions clarifying queries about the Conditions of Contract.

2.2 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement
(2) Letter of Acceptance, notice to proceed with the works
(3) Contractor’s Tender
(4) Contract Data
(5) Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bill of quantities and
(9) Any other document listed in the Contract Data as forming part of the Contract.

3. Law governing contract

3.1 The law governing the Contract is the Laws of India supplanted by the Karnataka Local Acts.

4. Employer's decisions

4.1 Except where otherwise specifically stated, the Employer will decide contractual matters between the Employer and the Contractor.

5. Delegation

5.1 The Employer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

7. Subcontracting

7.1 The Contractor may subcontract with the approval of the Employer but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer.

9. Personnel

9.1 The Contractor shall employ the technical personnel [*of number and qualifications]* as may be stipulated by GOK from time to time during the execution of the work. The technical staff so employed shall be available at site as may be stipulated by the Employer.

9.2 If the Employer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Contractor's risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's risks

11.1 The Employer is responsible for the expected risks which are (a) in so far as rebellion, riot commotion or disorder or (b) a cause due solely to the design of the works, other than the Contractor's design.

12. Contractor's risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13. Insurance:

13.1 Deleted

13.2 Deleted

13.3 Deleted

13.4 Deleted

13.5 Deleted.

14. Site Investigation Reports:

14.1 Deleted

15. Queries about the Contract Data

15.1 The Employer will clarify queries on the Contract Data.

16. Contractor to construct the Works

16.1 The Contractor shall construct the Works in accordance with the Specification and Drawings.

17. The Works to be completed by the Intended Completion Date

17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor, as updated with the approval of the Employer, and complete them by the Intended Completion Date.

18. Approval by the Employer:

18.1 Deleted.

18.2 Deleted

18.3 Deleted.

18.4 Deleted

18.5 Deleted.

19. Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Employer of such discoveries and carry out the Employer's instructions for dealing with them.

21. Possession of the Site

21.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

22. Access to the Site

22.1 The Contractor shall allow the Employer and any person authorized by the Employer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

23. Instructions

23.1 The Contractor shall carry out all instructions of the Employer which comply with the applicable laws where the Site is located.

24. Procedure for resolution of Disputes:

24.1 Deleted.

24.2 Deleted.

24.3 Deleted.

B. Time Control

25. Program

25.1 Within the time stated in the Contract Data the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

25.2 The Employer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Employer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

26. Extension of the Intended Completion Date

26.1 The Employer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date.

26.2 The Employer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information.

27. Delays ordered by the Employer

27.1 The Employer may instruct the Contractor to delay the start or progress of any activity within the Work.

28. Management meetings

28.1 The Employer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the progress achieved and the plans for remaining work.

28.2 The responsibility of the parties for actions to be taken is to be decided by the Employer either at the management meeting or after the management meeting and stated in writing to be distributed to all who attended the meeting.

C. Quality Control

29. Identifying defects

29.1 The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Employer may instruct the Contractor to search for a Defect and to uncover and test any work that the Employer considers may have a Defect

30. Tests

30.1 If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

31. Correction of defects

31.1 The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

31.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Employer’s notice.

32. Uncorrected defects

32.1 If the Contractor has not corrected a Defect within the time specified in the Employer's notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. Cost Control

33. Bill of Quantities (BOQ)

33.1 The BOQ shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

33.2 The BOQ is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the BOQ for each item

34. Variations

34.1 The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him

(a) Increase or decrease of any item of work included in the Bill of Quantities (BOQ);
(b) Omit any item of work;
(c) Change the character or quality or kind of any item of work;
(d) Change the levels, lines, positions and dimensions of any part of the work;
(e) Execute additional items of work of any kind necessary for the completion of the works; and
(f) Change in any specified sequence, methods or timing of construction of any part of the work.

34.2 The Contractor shall be bound to carry out the work in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the contract.

34.3 Variations shall not be made by the Contractor without an order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BOQ so long as the work executed conforms to the approved drawings.

34.4 The Contractor shall promptly request in writing the Employer to confirm verbal orders and if no such confirmation is received within 15 days of request, it shall be deemed to be an order in writing by the Employer

35. Payments for Variations

35.1 Payment for increase in the quantities of an item in the BOQ up to 25% of that provided in the Bill of Quantities shall be made at the rates quoted by the Contractor.

35.2 For quantities in excess of 125% of the tendered quantity of an item as given in the BOQ, the Contractor shall be paid at the rate entered in or derived from in the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract.

35.3 If there is no rate for the additional, substituted or altered item of the work in the BOQ, efforts would be made to derive the rates from those given in the BOQ or the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) and if found feasible the payment would be made at the derived rate for the item plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract

35.4 If the rates for additional, substituted or altered item of work cannot be determined either as at 35.1 or 35.2 or 35.3 above, the Contractor shall be requested to submit his quotation for the items supported by analysis of the rate or rates claimed, within 7 days.

35.5 If the Contractor's quotation is determined unreasonable, the Employer may order the Variation and make a change to the Contract Price which shall be based on Employer’s own forecast of the effects of the Variation on the Contractor's costs.

35.6 If the Employer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

35.7 Under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates for items falling under this Clause.

36. Submission of bills for payment

36.1 The Contractor shall submit to the Employer monthly bills of the value of the work completed less the cumulative amount paid previously.

36.2 The Employer shall check the Contractor's bill and determine the value of the work executed which shall comprise of (i) value of the quantities of the items in the BOQ completed and (ii) valuation of Variations and Compensation Events.

36.3 The Employer may exclude any item paid in a previous bill or reduce the proportion of any item previously paid in the light of later information.

37. Payments

37.1 Payments shall be adjusted for deductions for advance payments, other recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor the within 60 days of submission of bill. The Contractor shall be liable to pay liquidated damages for shortfall in progress. For Progress beyond the agreed programme, payment is subject to availability of the grants.

37.2 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

38. Compensation events

38.1 The following are Compensation events unless they are caused by the Contractor:

- (a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.
- (b) The Employer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
- (c) The Employer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.
- (d) The Employer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
- (e) The effect on the Contractor of any of the Employer’s Risks.
- (f) The Employer unreasonably delays issuing a Certificate of Completion.
- (g) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

38.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date is extended. The Employer shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

38.3 As soon as information demonstrating the effect of each Compensation event upon the Contractor's forecast cost has been provided by the Contractor, it is to be assessed by the Employer and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Employer shall adjust the Contract Price based on Employer’s own forecast. The Employer will assume that the Contractor will react competently and promptly to the event.

38.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Employer.

39. Tax

39.1 The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

40. Price Adjustment:

40.1 Deleted

41. Liquidated damages

41.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the

Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the Contract Data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

41.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

42. Advance Payments:

42.1 Deleted.

42.2 Deleted.

42.3 Deleted

43. Securities:

43.1 Deleted.

44. Cost of Repairs:

44.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

45. Completion

45.1 The Contractor shall request the Employer to issue a Certificate of Completion of the Works and the Employer will do so upon deciding that the Work is completed.

46. Taking over

46.1 The Employer shall take over the Site and the Works within seven days of issuing a certificate of Completion.

47. Final account

47.1 The Contractor shall supply to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 90 days of receiving the Contractor's account if it is correct and complete. If it is not, the Employer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Employer shall decide on the amount payable to the Contractor and make payment within 60 days of receiving the Contractor’s revised account.

48. As built drawings and /or Operating and Maintenance Manuals

48.1 If “as built”[3] Drawings[17] and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

48.2 If the Contractor does not supply the Drawings by the dates stated in the Contract Data, or they do not receive the Employer’s approval, the Employer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

49. Termination

49.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

49.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) The Contractor stops work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer;

(b) The Employer instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 60 days;

(c) The Contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) A payment due to the Contractor is not paid by the Employer within 90 days of the date of the submission of the Bill by Contractor;

(e) The Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Employer;

(f) The Contractor does not maintain a security which is required;

(g) The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(h) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph : “corrupt practice” means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution. “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.”

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[3]

[17] □□□□□□□□□□□□□□□□□□□□

49.3 When either party to the Contract gives notice of a breach of contract to the Employer for a cause other than those listed under Sub Clause 49.2 above, the Employer shall decide whether the breach is fundamental or not.

49.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

49.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

50. Payment upon Termination

50.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Employer shall prepare bill for the value of the work done less advance payments received up to

the date of the bill, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be a debt payable to the Employer.

50.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall prepare bill for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract, and less taxes due to be deducted at source as per applicable law and make payment accordingly.

51. Property

51.1 All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor’s default.

52. Release from performance

52.1 If the Contract is frustrated by any event entirely outside the control of either the Employer or the Contractor the Employer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made

G. Special Conditions of Contract

1. Labour :

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Employer, deliver to the Employer a return in detail, in such form and at such intervals as the Employer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Employer may require.

2. Compliance with labour regulations :

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority.

The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, Employer shall have the right to deduct any money due to the Contractor including his amount of security deposit. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

3. Protection of Environment:

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

[Add other clauses specific to the works for which tenders are invited]

4. Contractor’s Inspection of Sites:

The Contractor is deemed to have visited the sites and familiarized himself of the conditions and restrictions under which the work will be executed. The omission of any details shall not relieve the Contractor of his prima facie obligation and responsibility under the Contract to carry out and successfully complete the rehabilitation works. The Employer will entertain no monetary or other claims, made by the Contractor on the grounds of ‘want of knowledge’.

The Contractor is advised that it is his sole responsibility to ascertain for himself the extent of work that is required to be done in site and to generally obtain his own information on all matters affecting directly or indirectly the execution of the whole works involved in the Contract to the complete satisfaction of the Engineer. The Engineer will entertain no claim of extras in consequence of any alleged ignorance in any aspect. It must be clearly and definitely understood that the Contractor shall be held solely responsible for making all necessary arrangements and coordinating with relevant authorities, competent agencies and specialists etc., to ensure satisfactory completion of the Contract

5. Before quoting the work, contractor has to inspect the site and make himself aware of the site condition.

6. Compulsorily Road cutting machines shall be used to excavate along Asphalted or concrete roads without extra cost. The alignment width should be marked before excavation and shall be cut by machine so that it should not damage/loosen the other portion.

7. Sufficient Barry Cades, Caution Boards and Diversion Boards shall be provided at the work site for public safety and road users without extra cost. This should be maintained till completion of the work, as per instructions of Engineer Incharge.

8. All necessary diversions of traffic, temporary relocation, etc., required for the execution of the work shall be carried out without extra cost.

9. Making good the road surface which were damaged/worn out during execution and restoring the same to the original status.

10. Contractor has to identify the existing utilities running/crossing along the alignment and make safeguard of the utilities. If damaged, the contractor has to make good the same at his own cost.

11. **Co-ordination with concerned agencies**: The Contractor, shall co-ordinate with other Contractors/agencies of BWSSB, BBMP, BESCOM, BSNL, KPTCL, NHAI, BDA, KSPCB, etc., during the course of execution of works.

12. **Disposal of Excavated Earth and Debris**: The Contractor shall make his own arrangements to dispose of surplus excavated earth and debris at his own cost and BWSSB will not be responsible in any manner. The Contractor shall not cause any inconvenience and nuisance in any manner to the public. The Contractor shall obtain necessary clearness/permissions at his own cost from police or any other statutory bodies/authorities concerned. BWSSB shall be indemnified from any issues arising out of this Contract.

13. Clearing of site after execution and before leaving to public use in all respects including unused Materials.

14. Contractor shall be ready to work in shifts, and to deploy extra fronts if works to be carried out in Traffic roads/Narrow roads where permission available is limited and conditional ,Such cases contractor has to work depending on site conditions and situations as per the instructions of Engineer Incharge, without extra cost,

15. The works to be executed in accordance with the contract documents and to carry out all the works as per the guidelines in the **"Draft Safety Manual for construction** and maintenance of UGD Lines and septic tanks in Urban Areas -2013". Any lapses in following the safety guidelines, the contractor/ agency/ firm will be held solely responsible.

16. Contractor has to quote considering all above aspects, and no extra claims will be allowed for the above conditions.

17. Jurisdiction of Courts/Arbitration: The sitting of arbitration shall be held at Bangalore only and nowhere else.

18. Dispute of any kind arising out of the contract shall be resolved within the jurisdiction of Bangalore City only and the parties agree and clearly understand that the courts/tribunals situated at Bangalore Metropolitan City have exclusive jurisdiction for the redressal of the disputes arising out of the contract and at no other place.

19. The Parties further agree and understand that the place or places of issue of bank guarantee other than Bangalore will have no jurisdiction to resolve dispute of any kind relating to enforcement of the bank guarantees submitted by the contractor at Bangalore for the execution of the contract at Bangalore.

20. The contractor shall comply with all the legal requirements in the matter of employment of workmen and provide all safety gadgets to the workmen while working in the hazards place or conditions during the execution of the contract.

21. Contractor shall be fully responsible in the event of death of employee/workman during the execution of the work and liable to pay adequate compensation to the dependents of employee/workman as per law.

22. On his/their failure, if the Board is made to pay compensation the same shall be recovered by the Board from the contractor out of the amounts due to the contractor or by appropriate legal action.

23. If death of any employees occurs during execution of work due to negligence of contractor, the contract will be liable for termination.

24. In the event of such termination, the employer may consider blacklisting of firm after due notice.

25. In case of any death or accident the contract will be cancelled after following due process.

26. The Board will be entitled to claim exemplary damages from the contractor in case of death of any work man / employees of the contractor in any of the BWSSB works as it damages the reputation of the Board.

27. The tenderer should have satisfactorily completed one similar work to an extent of 50% of the cost the works.

Annexure:

LIST OF ORGANIZATIONS WHO ARE CONSIDERED AS APPOINTING AUTHORITY FOR APPOINTMENT OF ARBITRATORS

Deleted

SECTION 6:
CONTRACT DATA

Items marked "N/A" do not apply in this Contract.
The following documents are also part of the Contract: Clause Reference

- The Schedule of Operating and Maintenance Manuals [48]
- The Methodology and Program of Construction [25]
- Site Investigation Reports [14]
- The Schedule of Key and Critical Equipment to be deployed on the work as per agreed program of construction. [25]

The Employer is : Executive Engineer
Name: Mr.N.Basavaraj. [1.1]
Address: Executive Engineer, South East -2 Water Supply & Sanitary Division
BWSSB, Kapila Bhavan, 11th main, 35th cross 4th T Block, Jayanagar,
Bangalore-560041.
Name of authorized Representative: Mr.N.Basavaraj.
No.BWSSB /EESE-2/TO/PB/2946 /2024-25/ Dt: 22.01.2025
[insert name and number as indicated in the Invitation for Tenders]. [1.1]

The name and identification number of the Contract is : Tender for the Work of providing and laying 100, 150, 200 mm dia water supply line to improve water supply facilities to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE 5 sub division.

The work details are as per Schedule-B and the work should be carried out under the instruction of AEESE-5.
The start date shall be the date of issue of notice to proceed with the work. [1.1]

The Intended Completion Date for the whole of the Works is ***SIX Months from the date of commencement***[4] with the following milestones [17, 26]

Milestone dates:

	Physical works to be completed	Period from the date of issue of Notice to proceed with the work
Milestone 1	Tender for the Work of providing and laying 100, 150, 200 mm dia water supply line to improve water supply facilities to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE 5 sub division.	***Six months***

The Site Possession Date is: **10 days after issue of work order** [21]

The alignment to Ibbalur Village, Bellandur, coming under Bellandur service station of AEE SE 5 sub division.

The Defects Liability Period is **365** days [31]

The liquidate damages for the whole of the works are
Rs.0.1% 1 day of Contract Value
The maximum amount to liquidated damages for the whole of the woks is **ten percent** of final contract price.
[41]
[25]The date by which "as-built"[26] drawings (in scale……..[27]) in 2 sets are required is within 30 days of issue of certificate of completion of whole or section of the work as the case may be.
[48]
The amount to be withheld for failing to supply "as built"[28] drawings or supply of operation and maintenance manuals by the date required is **Rs.500/-per day** [48]
The following events shall also be fundamental breach of the contract : [49.2]

1. The contractor has contravened Sub-clause 7.1 and Clause 9 of CC

The percentage to apply to the value of the work not completed representing the employeers additional cost for completing the work shall be 30%.

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[23] The period should depend up on the period required for testing of the work. In case of building it could be 12 months (passing on 1 rainy season) for pipe laying work , tanks, water retaining structures, the time required for testing, for canals, lining works, the passing of one monsoon or running of canal whichever is lower, roads and highways passing of on monsoon (12months)

[24] The amount is usually computed on the basis of 0.1% of the contract price per day.

Executive Engineer
Water Supply & Sanitary Division(SE-2)

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[4] Fill in the exact date of completion at the time of agreement

2nd floor, 34th cross, 11th main,4th 'T'block
Jayanagar, Bangalore-5600041
Phone: 080-22945389

SECTION 7: SPECIFICATIONS

TECHNICAL SPECIFICATIONS

INDEX

1.1. SCOPE OF WORK.
2.0 EARTHWORK EXCAVATIONS.
2.1. GENERAL
2.2. CLASSIFICATION OF EXCAVATION
3.0 GLAZED STONEWARE (GSW) PIPES.
7.0 ANCILLARY STRUCTURES – MANHOLES, DROP MANHOLES AND VENTILATING SHAFTS.
11.0. REINSTATEMENT OF ROADS.

Specifications

1.1. Scope Of Work.

The scope of work under this contract shall be as detailed above and as specified in Bill of Quantities in Section-7,

1.2. contractual requirements

1.2.1. Contractor's Inspection of Sites:

The Contractor is deemed to have visited the sites and familiarized himself of the conditions and restrictions under which the work will be executed. The omission of any details shall not relieve the Contractor of his prima facie obligation and responsibility under the Contract to carry out and successfully complete the rehabilitation works. The Employer will entertain no monetary or other claims, made by the Contractor on the grounds of 'want of knowledge'.

The Contractor is advised that it is his sole responsibility to ascertain for himself the extent of work that is required to be done in site and to generally obtain his own information on all matters affecting directly or indirectly the execution of the whole works involved in the Contract to the complete satisfaction of the Engineer. The Engineer will entertain no claim of extras in consequence of any alleged ignorance in any aspect. It must be clearly and definitely understood that the Contractor shall be held solely responsible for making all necessary arrangements and coordinating with relevant authorities, competent agencies and specialists etc., to ensure satisfactory completion of the Contract.

1.2.2. Tender Drawings and Contract Documents: NA

1.2.3. Time of completion.

Time period for completion of all the works shall be 2 Months (inclusive of monsoon period) from the date of issue of notice to commence. Within this period Contractor shall be required to complete the works, including testing, commissioning and completion of the three months Trial run period.

1.2.4. Work plan.

The Contractor shall prepare the work plan for the execution of works, which includes procurement of pipes before starting of the works. The Contractor shall submit the planning's (Construction, Financial, Quality and Commissioning and handing over planning's) within 14 days after issue of letter of acceptance and take necessary approvals for the same. The planning’s shall be in the form of a PERT/CPM and a bar chart together with description of his proposed method of working. The planning shall include all allowances to guard against delays caused due to inclement weather or its effects (such as floods or draughts), fire or industrial disputes, unless such events could not reasonably have been foreseen by an experienced Contractor.

1.2.5. Alignment Survey and the L-Sections.

The contractor shall carry out the Survey work for laying of lateral sewers (less than 300 mm diameter) for proposed alignment and levels, at every 30 meters interval and other necessary locations, before execution of the work, including all data required for generating L section and GIS maps of sewer network. Contractor shall submit the survey drawings showing L-Sections, ground levels at every 30 meters interval and other necessary locations, detailed strip plans showing adjacent structures etc., in latest version of AutoCAD for approval of the Engineer before execution of the work. The Bidder has to consider this aspect and make provision, while quoting the rates for Sewer pipe (less than 300mm), supply, laying and jointing item in the tender. If the alignment and flow directions of the sewers are to be changed according to the site conditions and the Engineer In-charge agrees to that, the contractor has to redo the alignment and level survey at every 30m and junction points, and submit all the details in latest version of Auto Cad in soft form to BWSSB, for re-design of that particular stretch and take up the work on receipt of approved designs from BWSSB.

Also, The contractor shall carry out the Survey work for laying of branch / submain /main / trunk sewers (230 mm diameter & above) for proposed alignment and levels, at every 30 meters interval and other necessary locations, before execution of the work, including all data required for generating L section and GIS maps of sewer network. Contractor shall submit the survey drawings showing L-Sections, ground levels at every 30 meters interval and other necessary locations, detailed strip plans showing adjacent structures etc., in latest version of AutoCAD for approval of the Engineer before execution of the work. The contractor shall take prior approval for location and length of the survey work for this paid item. The payment will be made as per the quoted rates for conducting survey in bill of quantities. If the alignment and flow directions of the sewers are to be changed according to the site conditions and the Engineer In-charge agrees to that, the contractor has to redo the alignment and level survey at every 30m and junction points, and submit all the details in latest version of Auto Cad in soft form to BWSSB, for re-design of that particular stretch and take up the work on receipt of approved designs from BWSSB.

The alignments, L-section and location of manholes may be changed at site if required, and after approval of the Engineer.

The Survey work for all the sewer lines (for all diameters of sewers) alignment shall also include the following,

a) All the Survey works shall be carried out from G.T.S. Benchmarks, using Total Station instrument of standard make, and by qualified survey personnel. The survey shall consist of field data collection and related attribute information collection of all the aspects pertaining to GIS mapping of sewer network before and after laying of sewer pipes and allied structures, as required by BWSSB.

b) Field attribute collection for Mapping with respect to Existing sewerage network does not require any digging in the field. The existing maps / BWSSB field staff knowledge can be utilized by the bidder to provide the data for mapping the said network and it will be paid as per the survey work item in Bill of quantities.

c) Network entity’s attribute information like pipe dia, pipe type, ground material, depth of the pipe, manhole type, manhole size, manhole depth etc. shall be submitted.

d) The data pertaining to House Service Connections (connection to consumers) have to be collected up to building footprint and submitted.

e) The contractor shall communicate regularly, with the BWSSB regarding the GIS mapping survey data and for clarifications.

The Contractor shall, within 21 days after the date of the Letter of Acceptance, submit to the Engineer for his consent a detailed description of the arrangements for conducting the quality control program during execution of the Works, including details of his testing Laboratory, equipment, staff and general procedures. If following submission or at any time during the progress of Works, it appears to the Engineer that the Contractor's quality control programme is not adequate to ensure the quality of the Works, the Contractor shall produce a revised program as desired by the Engineer, which will be adequate to ensure satisfactory quality control.

a. *Tests during Construction : As per Sepecification*

b. *Third Party Inspections :* ***As per GO No.FD55 Pro-Cell 2004, Bangalore Dt: 17.02.2005, the expenditure on the employment of the quality supervision consultants will be charged to the cost of works and goods and equipment's under procurement, also take action as per circular No. BWSSB/EIC/CE (M)/ACE (M)-I/DCE (M)-II/TA(M)-I/2012/17-18 dt:03.07.2017, further action will be taken to recover the cost of the above in the contract bills****.*

1.2.9. Sign Board

The Contractor shall provide sign boards at the sites of the Works of approved size and design as directed by the Engineer, which provides (i) the name of the Project and the financing agency (World Bank loan); (ii) the names and addresses of the Employer, Contractor and Consultants; (iii) short description of the Project, (iv) the Contract amount (v) the starting and completion dates.

Such sign boards shall be located at specified places in the project coverage area as directed by the Engineer. Contractor shall take care of signboard and replace it in case of loss, damage, theft etc., the sign boards may be in English or Kannada or in both as directed by the Engineer.

1.2.10. Protection of Utilities

The Contractor is required to examine carefully the locations of the works and their alignments. Contractor is to make enquiries and co-ordinate with all the departments /authorities concerning all utility lines such as water pipes, sewers, gas pipe, telephone (underground and /or overhead) lines, optic fibre cables, electric and telecommunication cables (underground and /or overhead) , any other utility lines etc; to determine and verify to his satisfaction the character, sizes, position and lengths of such utilities from authentic records.

The Contractor shall be wholly responsible for the protection of such utilities as may be required, and shall not make any claim for extra work or extra time that may be required to protect such utilities. Any damage, to the Utilities shall be restored/ repaired at Contractor's own cost. Shifting of any utilities if required will be taken up by BWSSB or any other agency separately after site inspection.

In case the alignment of the pipeline crosses the high tension electrical transmission lines belonging to the KPTCL / BESCOM or other authorities/ departments, the Contractor shall take all precautions necessary to see that the work is carried out with care and safety, without disturbing such transmission lines. The Contractor will be responsible to carry out all construction activities in such reaches in consultation with the owners of such facilities. However, satisfactory completion of the entire work will be the responsibility of the Contractor.

1.2.11. Performance Requirements:

The performance requirements have been spelt out in various parts of the Contract specification. The Contractor shall ensure that, he fully understands and complies with all the requirements specified in the Contract. However, in the event of any conflicting performance requirements spelt out in the documents, the Contractor shall promptly bring such matters in writing to the attention of the Engineer for Engineers decision. The Engineer’s decision will be conveyed to the Contractor in writing and which is final. The Contractor shall fully comply with Engineer’s decision on the matter.

The Contractor is deemed to have read and understood all performance requirements before bidding and he shall have no claim whatsoever with respect to the Engineer’s final decision on the matter.

1.2.12. Contractor’s Obligations:

The Clauses in this section are meant to provide general guidelines and Compliance requirements to the Contractor. It does not however relieve the Contractor from taking every other step and precautions as deemed necessary to complete the works successfully within the specified Contract period and bid amount. Also, compliance to the approved Environmental management plan and monitoring the same is part of the contract.

12.12.1. Environmental Management Plan and Monitoring.

The Contractor shall be responsible for the mitigation measures to be taken for complying to the Environmental management plan and monitor as described below,

1.2.14. Special Traffic Precautions.

Contractors Attention is specially drawn to the requirements by the traffic police and road authorities and specification regarding traffic control, access and reinstatement of road surface. It is necessary to obtain permission from traffic Inspector of Police prior to taking up any stretch of road for excavation and sewer laying. It is necessary to carry out the work in such a manner as to cause minimum interference with the public use of roads, footpaths and other thoroug

1.2.15. Working in Restricted areas.

In addition to the clause stated in other section of the special specification the Contractor shall determine prior to constructing the lengths of sewers where access to properties commercial, domestic and institutional will be restricted.

The identification of these areas shall be agreed in consultation with the Engineer, Police and Urban local body. In this case it may be necessary to operate one-way traffic system or to close roads. The Contractor shall be responsible for liaising with the police and other local representatives to obtain permission to close roads or restrict traffic movement. No additional time will be allowed for these pre-construction activities. Where roads are closed alternative routes are to be determined in conjunction with the authorities. Sign Boards are to be placed at both junctions of the route indicating “ROAD CLOSED & WORK UNDER PROGRESS”. The expense for the same shall be borne by the contractor. The Contractor shall discuss these arrangements with the occupants of houses affected to ensure that their disruption is kept to a minimum. The Contractor is to offer assistance to residents who are infirm or need special arrangements for access during construction.

In narrow roads and streets it may not be possible to operate excavation machinery in such cases hand excavation is to be done. The method of operation, length of sewer to be excavated, method of barricading, property access, dewatering, shoring, pipe laying, backfilling and road reinstatement shall be stated in a ‘Method Statement’ to be submitted at least 4 weeks before work is scheduled to commence in a particular location. The written agreement of the Engineer shall be obtained to the method statement. If any additional safeguards are required by the Engineer these shall be incorporated in the method statement at no extra cost and the method statement is to be resubmitted.

The Contractor will ensure that the noise created by his activities is suppressed. Adequate silencers fitted to construction machinery, particularly compressors and drills. Dust is to be kept to a minimum by using water sprinklers. Utility service connections shall be maintained to every property throughout the construction phase and thereafter. If any defect/ damage is caused it shall be repaired immediately and at the Contractors expense. The disruption to the normal activities of residents and other members of the public is to be kept to an absolute minimum. Providing adequate noise control and other nuisances are kept to a minimum, extended working hours may be permitted with the agreement of the Engineer and local residents. No additional payment shall be made for any of these arrangements unless other wise specified. Adequate lighting shall be provided by the Contractor at his cost if night working is adopted.

1.2.16. Interfaces with other packages.

If this contract Package will have interface with other contracts, the contractor shall only undertake the end connections of sewers at the interface points, after the sewer has passed the hydraulic test on completion of end connections. The contractor shall lay the bedding and backfill for sewers in normal manner.

1.2.17. Order Of Precedence Within Bid Documents

In the event there is any conflict or discrepancy within the Bidding documents, the order of Precedence will be determined as follows;

1. Addendum
2. Contract data
3. Instruction to Bidders
4. Invitation to Bid
5. General conditions contract including special conditions contract
6. Technical specifications
7. Bill of quantities.
8. Drawings

1.2.18. Technical and Supervisory Staff : NA

1.2.19 MEASUREMNTS & PAYMENTS.

1.2.19.1. MEASUREMENTS

a. Quantities

The quantities set out in the Bill of Quantities are the estimated quantities for the Works, and they are not be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

b. Works to be Measured

The Engineer shall, except as otherwise stated, ascertain and determine by measurement the value of the works in accordance with the contract and the contractor shall be paid that value in accordance with applicable clauses of this contract. The Engineer shall, when he requires any part of the works to be measured, give reasonable notice to the Contractor’s authorized agent, who shall:

a) forthwith attend or send a qualified representative to assist the Engineer or his representative in making such measurement, and

b) supply all particulars required by the Engineer or his representative.

Should the Contractor not attend, or neglect or omit to send such representative, then the measurement made by the Engineer or his representative or approved by him shall be taken to be the correct measurement for such part of the works. For the purpose of measuring such Permanent Works as are to be measured by records and drawings, the Engineer shall prepare such records and drawings as the work proceeds as he deems necessary or appropriate and the Contractor, as and when called upon to do so in writing, shall within 14 days, attend to examine and agree such records and drawings with the Engineer and shall sign the same when so agreed. If after examination of such records and drawings, the contractor does not agree the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor, within 14 days of such examination, lodges with the Engineer notice of the respects in which such records and drawings are claimed by him to be incorrect. On receipt of such notice, the Engineer shall review the records and drawings and either confirm or vary them.

c. Method of Measurement

The Works shall be measured net, notwithstanding any general or local custom, except where otherwise provided for in the Contract.

1.2.19.2. PAYMENTS.

No part payments will be made for all items of works under this contract, except for pipeline works, which will be paid as mentioned in contract data.

2.0 EARTHWORK EXCAVATIONS.

2.1. General

The Earthwork Excavation for laying of sewers shall be carried out as per applicable IS specifications, specification in the Bill of quantities and applicable clauses in this specifications.

The Contractor shall make all excavations required for laying and jointing of the pipeline and construction of pertinent structures as required by the project. Except where otherwise required by the project or instructed by the Engineer, all excavation shall be in open cut, to the specified widths and depths with shoring, strutting and bracing. The Contractor is advised to satisfy himself and quote rates accordingly with regard to the likely conditions that may be met with during the execution of the works, with regard to the underground obstructions or conditions, necessary dewatering requirements including well point system or other means of dewatering the trenches before, during and after excavation, laying of bedding material, laying and jointing sewers, hydraulic testing and till backfilling, construction of manholes, pipe supports etc., in sub terrain under ground water, rain water, sewage and waste water etc.

Earth work excavation for pipeline trenches and manhole chambers including depositing on bank including, danger lighting and using sight rails and boning rods, including shoring, strutting, bailing out water at every 100 metres wherever necessary as directed in the various strata with lead upto 30 meters and all lifts etc., complete. A minimum of three numbers of sight rails are to be maintained at all times during pipe laying between manholes, including barricading as per directions of Engineer In-charge of work. (The Excavation cost should include the cost of shoring, strutting to facilitate for laying, jointing & testing of sewers, manholes.)

2.2. Classification of Excavation

i). All Soils includes the following,

a). Soft clay, soft murrum, gravel shale etc. including. Stiff heavy clay, hard shale or compact murrum requiring drifting tool or pick axe or both and shovel closely applied.

b). Gravel, soft laterite, kankar and cobble stone having maximum diameter in anyone direction between 75 mm and 300 mm.

c). Soling of road paths etc., and hard core.

d). Macadam surfaces such as water-bound and bitumen/tar bound.

e). Lime concrete, stone masonry in lime/cement mortar below ground level.

f). Soft Conglomerate, where the stones may be detached from the matrix with pick axe.

g). Generally any material which requires the close application of pick axe or scarifiers to loosen and not offering resistance to digging, greater than that offered by the hardest of any soil mentioned above.

ii). D.I.R. soft rock and medium hard rock includes, a). Ordinary rock comprising of lime stone, sand stone, hard laterite fissured rock, conglomerate or other soft or disintegrated rock which may be quarried or split with crow bars.

b). Un-reinforced cement concrete which may be broken up with crow bars or pick axe and stone masonry in cement mortar below ground level.

c). Boulders which do not require blasting having maximum diameter in any direction of more than 300 mm; found lying loose on the surface or embedded in river bed, soil, talus, slope wash, and terrace material of dissimilar origin.

d). Hard laterite does not require blasting. It is to be classified under ordinary rock which does not require blasting.

iii). Hard Rock includes,

a). Any rock or cement concrete or RCC, excavation of which require the use of mechanical equipment or chiselling.

2.2.1. All soils.

The Earth work excavation in all soils, including the ones mixed with boulders of up to 30 cms size, includes excavation both by manual and machine excavation based on location of excavation and space constraints. The quoted rates are applicable for both manual and machine excavation, the location and extent of manual and machine excavation should be as described below,

a). Manual excavation.

The manual excavation for laying the sewers in pipeline trenches shall be carried out as decided and directed by the Engineer In-charge, along the alignment of such narrow roads and main roads where it is not possible for machine excavation and, at excavations in deeper depths of more than 3m, providing all safety measures to workmen at contractor’s risk, also, manual excavation is to be adopted at the possible locations of underground utilities to safeguard against damage.

b). Machine excavation.

The machine excavation for laying the sewers in pipeline trenches shall be carried out along the alignment of wide roads and in depths where there are no under ground utilities without causing any damage to public property, and inconvenience to public.

Disintegrated Rock, Soft Rock and Soft Shale

This category includes excavation in disintegrated rock, soft rock, soft shale and in medium rock comprising of lime stone, hard shale, schist, fissured rock, and all types of laterite with varying densities and composition requiring chiseling which can be cut by shovel and but without resorting to blasting.

Hard Rock

This category includes excavation in hard rock requiring hand and/or mechanical chiselling.

In case of difference in opinion between the classifications of rocks, the decision of the Engineer shall be final and binding on the Contractor.

2.3. Shoring and Bracing

As per Specifications and directions of the Engineer, the Contractor shall supply, fix and maintain necessary sheathing, shoring and bracing etc., in steel or wood, as may be required to support the sides of the excavation, to protect workmen in the trench and to prevent any trench movement which might any way injure or delay the work, change the required width of the trench, make unsafe condition for adjacent pavements, utilities, buildings or other structures above or below ground.

Sheathing, shoring and bracing shall be withdrawn and removed as the backfilling is being done, except when the Engineer may agree that such sheathing, shoring and bracing be left in place, at the Contractor's request. In any case, the Contractor shall cut off any such sheathing at least 600 mm below the surface and shall remove the cut off material from the trench.

All sheathing, shoring and bracing which is left in place under the foregoing provisions shall be removed in a manner so as to, not endanger the completed work or other structures, utilities or property, whether public or private.

2.4. Excavation in Rock

Excavation in rock shall be carried out without resorting to any kind of blasting, to a depth, 150 mm more than the bottom level of pipe and to a width equal to the diameter of the pipe plus specified working space on either side as given in drawing / as mentioned above. Unless otherwise directed by the Engineer, rock excavation shall be progressed at least by 20 m in advance of the pipe length proposed to be laid.

2.5. Limits of excavation.

The trench for laying of sewers and construction of manholes shall be excavated in accordance with the relevant applicable Indian standard, as per the approved drawings, or as directed by the Engineer. The width at bottom of trenches for sewers, unless otherwise specified in the approved construction drawings, or directed and approved by Engineer, for different diameters of pipes laid at different depths shall be as given below,

a). For all diameters, up to an average depth of 1.20 m, width of trench in mm is equal to diameter of pipe plus 300 mm.

b). For all diameters for depths above 1.20 m, width of trench in mm is equal to diameter of pipe plus 400 mm.

c). Not with standing (a). and (b). the total width of trench should not be less than 0.75 meters for depths exceeding 0.90 meters.

The width at top of trenches for sewers shall depend on depth of sewer, location and alignment of sewer, as per the approved construction drawings and directions of Engineer. Unless other wise specified in the drawings or directed by Engineer, for providing of sheet piling as per specifications in Bill of quantities, the top widths for excavations up to 2 meters depth shall be equal to bottom width (i.e. vertical side cuts.) and for depths beyond two meters depth, for all types of soils/rock, steps shall be provided of 0.30 m width on either side of the trench at every lift of 2 meters and as per the directions of Engineer. The quoted rates for excavations in accordance with the above specifications shall include all shoring and strutting for all depths.

The depth of excavations shall limit to the specified gradients/reduced levels as per the approved construction drawings at ends, considering the necessary beddings/encasement/surround.

The Contractor shall not excavate beyond the dimensions specified as above. Should the excavation occur beyond the dimensions specified therein, because of the negligence of the Contractor, the Contractor shall fill the excess space with granular material or concrete as directed by the Engineer. Nothing extra shall be paid to the Contractor on account of this. The contractor shall quote the rates for excavation items, limiting the trench widths as above for whatsoever depths encountered, including necessary arrangements as required. Any extra claim and increase in quantity other than the widths specified above, shall not be entertained or paid.

2.6. Trial pits

Trial pits shall be excavated by the Contractor, as directed to do so, along the lines of the trenches as shown on the drawings in advance of the excavations for the purpose of satisfying himself as to the location of under ground utilities, obstructions or soil strata's and conditions. Trial pits shall be excavated preferably by manual excavation. The contractor has to take the permission of the concerned Executive Engineer, BWSSB, before taking up the work.

It involves, Earth work excavation for trial pits in all kinds of strata and for all depths, recording necessary details of under ground utilities and kind of strata, including depositing on bank excavated earth, including barricading, posting safety sign boards, shoring, strutting, bailing out water, wherever necessary as directed with all lead and lifts etc., complete. Any damage to the existing utilities unless otherwise specified shall be repaired at Contractors own cost. The Precautionary measures shall be taken by the Contractor while making trial pits and shall inform the Engineer before commencing such works. The contractor will be paid as per the item in BOQ on account of this work.

2.7. Dewatering

Extra charges will be paid at quoted rates, for excavation in all classifications in watery situation or foul conditions towards dewatering including overnight recuperation for specified depth ranges with all lead and lifts etc., complete, including cost of installation and running of dewatering system such as well point system / any other system wherever required.

Dewatering shall be done in accordance with specifications. The Contractor shall be responsible for the adequate pumping, drainage and bailing out of water from the excavation in case of inundation etc., of trenches. The sewer lines shall be laid above normal ground water table level and as directed by the Engineer. Dewatering shall be either continuous or intermittent using Diesel pump or any other method approved by the Engineer. The method of dewatering shall depend on site condition and should be furnished by the Contractor and approved by the Engineer. The method of dewatering shall be either well point system or sump pumping. The effectiveness of each method will depend upon the nature of the soil, the proportions of the trench and degree of lowering required. Pumping test may be necessary to determine which method is Suitable.

If sump pumping is not practicable other control methods shall be considered and should be approved by the Engineer. The trenches should be kept dry till the completion of work, which includes excavation, pipeline laying, jointing, testing and commissioning and backfilling. Precaution should be taken against the floatation of the pipes.

The Contractor shall conduct ground studies if found necessary and the cost for such studies has to be borne by the Contractor himself. The

Contractor shall be responsible for the adequate pumping, drainage and bailing out of water met due to all causes from the excavation for laying sewer lines, construction of manholes, wet wells and all types of constructions. In case of failure to make such provisions or any other provisions, which may result in unsuitable sub-grade conditions, the Contractor shall replace and repair the sub-grade as directed to the satisfaction of the Engineer, at his own cost and responsibility. Should the Contractor select to use a gravel sub-grade with or without un jointed pipes with the gravel layers to facilitate flow of water to pumps or other points of disposal, such gravel sub grade with or without conveying pipes shall not be measured or paid as an extra item.

➢ Sump pumping

This method may be used in highly and moderately permeable soils such as gravels, sand and gravel mixtures. This method is simple and cheap to install and used with watertight trench sheeting to limit the volume of flow. To prevent the boiling in the bottom of the trench the following precaution should be taken

- Drive sheeting deeper to lengthen drainage path
- Use open pipe surrounded in gravel as a sump.
- Move the sump to one side of the trench

To prevent removal of fines from soil causing loss of strength in the soil and undermining of the trench bottom and side support

- Surround suction inlet with protected graded filter
- Increase flow rate through the soil by using open pipe surrounded with gravel.

The delivery side of the pump should be monitored by taking samples of water and checking the proportion of fines being removed. If fines are being continuously withdrawn or there are signs of trench instability, sump pumping should be stopped and alternative methods to the considered.

➢ Well pointing

In this method, well points are installed at regular intervals on one or both sides of the trench and linked parallel to a header main connected to a pump. Well points are usually installed at 0.6 to 2.0m centre to centre by jetting them in ground with dense layers or cobbles & boulders it may be necessary to pre bore the layers. The efficiency of the well points is increased by sanding in the well point and riser using a column of sharp sand. This Method has an advantage of drawing water away from the trench and in suitable conditions is effective in lowering the water by 4 to 6m. It will also reduce the hydrostatic heads on the trench support system. It is of greatest use, in sand, the heavy flows in permeable ground, such as gravels, the well points should not to be so close together that the method becomes impractical. In clays the rate of seepage is too small for the system to be properly effective. Silts can be stabilized in certain conditions by using special procedures.

The well pointing shall be either single sided well point or double sided well point. For higher depths double sided well point with multi stage shall be considered. Should the Contractor select to use a gravel sub-grade to facilitate flow of water to pumps or other points of disposal, such gravel sub-grade shall not be measured or paid for as an extra item. Contractor should assess the availability of extra earth required for refilling in case of shortage in any particular reach well before quoting rates. Even in case the Contractor resorts to mechanical excavation, the Contractor should take care of proper refilling, consolidation and disposal of surplus earth. Disposal of ground water is to be away from the area of influence of the pipe laying area Suitable temporary pipelines are to be laid to existing watercourses.

2.8. Slips and slides

The Contractor is responsible for proper protection of excavations made by him from any slips and slides. All slides and caving shall be handled, removed or corrected by the Contractor without any extra compensation at whatever time and under whatever circumstances they may occur. The excavations shall be made good and brought to necessary depth, width and levels without any extra cost. Special care should be taken to protect the safety of the workmen, staff and public or whoever at the site.

2.9. Stacking of excavated material

Pursuant to specification in Bill of Quantities or directions of Engineer in-charge of execution, the excavated material shall be stacked at suitable locations so as not to cause any inconvenience to the public or traffic, with all safety measures in accordance with IS 3764 with latest revisions and amendments. The excavated material shall be placed away from the sides of the trench. The excavated materials shall be stacked at a suitable distance, keeping in view the safety aspect of working personnel due to sliding and slippage based on nature of soil and condition. The contractor shall be solely responsible for the untoward incident caused due to his negligence of stacking the excavated material. Under circumstances where in, sewers have to be laid in narrow pathways, the excavated material shall be transported or placed with all lifts & lead as detailed in bill of quantities to the nearby suitable place or as decided by the Engineer and brought back after laying and jointing for refilling of the trenches as per specifications under clause 2.11.

2.10 Barricading.

The contractor shall Provide, erect and remove casurina pole three tier barricading using poles of 7.50 to 10 cms. Dia. And 1.50m height above ground fixed vertically at intervals of 2.0 to 2.5 mtrs. C/C and Horizontally at 0.50 mtrs, above ground level, including fixing poles in the ground for a minimum depth of 0.30 mtr. and tied with coir rope firmly including cost and conveyance of all materials, labour, lead and lift charges complete. The work will be paid as per the item in the BOQ.

2.11 : NA

2.12. Safety measures

Pursuant to Specifications in bill of quantities, relevant Indian standards or directions of the Engineer, the Contractor shall provide adequate safety measures. They shall include:

1. Barricading all sides of the open trenches.
2. Red danger lights as can be easily visible from dusk to dawn at an interval of 20 m and at all the road crossings.
3. Traffic signals and display boards giving direction for diversion of traffic at the appropriate places as may be directed by the Engineer.
4. Adequately safe wooden plank / board or steel plate over the trenches at every 15 meters interval or less depending upon access requirement to commercial, institutional and domestic properties to facilitate crossing by the public residing on either side of the trench.
5. Round the clock watch and ward maintaining all safety regulations at the site of work and protecting the site from unauthorized intrusions.
6. The work due to the above facilities/arrangements by the contractor will be paid for the items in bill of quantities and the cost for the remaining shall be deemed to be included in the relative items of work.

2.13. Progress of Excavation

The Contractor shall adjust excavation of trenches in such lengths that the pipes can be laid in such exposed portion of the trench within 3 days / less than 3 days as per criticality of site condition and directions of the Engineer.

Unless otherwise directed by the Engineer, the following limitations for lengths of open trenches shall rule for a pipeline in one continuous reach.

Not more than 50 m in built up area and 150 m elsewhere shall be opened in advance of pipe laying.

Not more than 50 m of pipeline left uncovered after pipe laying in built up areas and not more than 150 m elsewhere.

2.14. Excavation for Manholes and Other Appurtenant Structures.

Excavation for Manholes and other appurtenant structures shall be done in accordance with the applicable clauses from 2.1 to 2.14 of this Section. The Contractor shall excavate as required for all the structures with foundations to firm, undisturbed earth up to the level of the under side of the structure.

If the excavation is in rock, the Contractor shall excavate all rock at least to the minimum limits shown in approved drawings.

The standard details for trenches and to the grade of the bottom of Manholes and other structures are as per applicable clauses in this section and construction drawings issued for the execution of work. Where the bottom of the structure is in rock, it should be ensured that no rock shall project above the lower surface of the concrete in such a manner so as to reduce the required thickness of concrete placed simultaneously as an integral part of the foundation and to the outside of structure foundation where structure is to be built.

The Contractor shall excavate the trench / pit to provide necessary working space on all sides and for accommodating any sheathing, shoring or bracing etc.

2.15. Works Included in Excavation

The following works as per specifications are also included in excavation and the term 'Excavation' shall construe to mean all such items of work. The quoted rates should include the same:

1. Provision of side space or additional space in the trench / pit for working and /or accommodating sheathing, shoring, bracing, etc.
2. Supply, installation and removal after the work, all-sheathing, shoring and bracing required, protecting the excavation where required or where such work is recommended by the Engineer.
3. The bidder shall verify the site conditions and wherever such dewatering is required it is considered that the rates quoted for dewatering item of work are inclusive of dewatering of surface and sub-surface water.

4. Protection of excavations.
5. Providing adequate safety measures.
6. Additional work in connection with overhead wires and poles.
7. Excavations for socket and collar hollows.
8. Supplying and fixing of sight rails and boning rods in the trench to facilitate measurement of work etc. complete
9. Temporary approaches to roads, properties etc., affected by excavation at no extra cost.

2.16. Sheet piling : NIL

4.0 REINFORCED CEMENT CONCRETE PIPES

4.1. Manufacture of pipe

The RCC pipes to be used for lateral, branch and trunk / outfall sewers shall be of class NP-3, Spigot and Socket (S&S) type, RCC SPUN / VIBRATED CAST PIPES (REINFORCED), with rubber gasket jointing, manufactured in Conformity with IS 458. All the Pipes shall be manufactured using Sulphate Resisting cement only. The ends of the pipes shall conform to Clause 5.3 of IS 458 as applicable for S&S joints. The rubber ring shall conform to IS 5382 and IS 12820 as applicable for sewer lines and shall be of type 'IA'. The diameters of pipes shall be as required for sewers as per designs and drawings.

The method of manufacture shall be such that the form and dimensions of the finished pipes are accurate within the limits specified in relevant IS: 458. Pipes manufactured in compliance with IS: 458 shall be either water cured or steam cured in accordance with the relevant requirements of IS: 458.

The Internal diameter, wall thickness, length of barrel, reinforcement (longitudinal and spiral), type of ends and minimum clear cover to reinforcement, strength test requirements, tolerances on - overall length, internal diameter or dimensions of sockets / spigots of pipes shall be as per the relevant clauses / tables of

IS: 458. Minimum clear cover to reinforcement shall be 15 mm. The tolerances regarding overall length, internal diameter of pipes or socket and barrel wall thickness shall be as per relevant clauses of IS: 458. Each pipe unit shall be in lengths of 2 m to 4 m based on availability, ease in handling, transportation and laying.

The workmanship and finish for the pipe will conform to the relevant Indian standard specification; Cleaning of pipes shall conform to relevant Indian Standard specification.

4.1.1. Special coating for Inside Surface of RCC Pipes.

The RCC pipes shall be provided with special coatings wherever there is possibility of excess generation of hydrogen sulphide gas during transportation of sewage through sewers. The location, length of coatings shall be as given in construction drawings or as approved by the Engineer.

The work involves

i). Supply and application of Polymer based protective Elastomeric coating / Lining with zero V.O.C. for complete inside surface of RCC sewers, with minimum dry film thickness of 1mm, Acid resistant, Abrasive resistant, Adhesive to concrete surface, Durable and pinhole / break free, with smooth surface after application, complete as per the Clauses in this Section, including all labour, HOM of machinery, with all lead lifts, taxes etc. complete. spray coating / Lining shall be applied by approved and controlled mechanical spray method, for RCC sewers of diameters 400mm to 800 mm prior to delivery of sewers to site or applied at site, as approved by approving authority, including all surface preparation, testing, as per directions of the Engineer in charge. Rate shall be inclusive of cost of all materials, tools and plants, testing and inspection etc. complete.

ii) Supply and application / lining of Polyvinyl chloride sheet, having T-shaped protections on the back, keyed into the RCC Sewer walls at the time of manufacture, of thickness not less than 1.5mm or Polymer based protective Elastomeric smooth coating / Lining with zero V.O.C. by spray method for complete inside surface of RCC sewers, with minimum dryfilm thickness of 1mm, Acid resistant, Abrasive resistant, Adhesive to concrete surface, Durable and pinhole / break free, smooth surface after application, complete as per the Clauses in this Section, including all labour, HOM of machinery, with all lead, lifts, taxes etc. complete, spray coating / Lining applied by approved method, for RCC sewers of diameters equal to and greater than 900mm prior to delivery of sewers to site or applied at site, as approved by approving authority, including all surface preparation, testing, and directions of the Engineer in charge, Rate shall be inclusive of cost of all materials, tools and plants, testing and inspection etc. complete.

Specifications for Protective Coating to inside surface of RCC sewers:-

A). POLYMER BASED COATING :

a) The inside of RCC pipes (of dia 400mm & above) & manholes (if required) shall be coated with an approved dual-component, solvent-free polymer protective coating of minimum 1mm dry film thickness. The protective coating shall be spray-applied to the inside of the pipes using suitable plural component spray equipment so as to form a completely impermeable, pin-hole-free & seamless lining. It shall form a good bond with host concrete surface, be resistant to acids & abrasion. It shall meet the following properties.

A – ACID RESISTANCE	
Acid & Chemical Resistance (to ASTM 3908- mod 365d immersion)	Change in weight (not more than).
Sulphuric Acid 22%	0.07%
Hydrochloric Acid 10%	0.07%
H2S-120,000ppm (Sour Brine)	0.66%
Sodium Hydroxide 25%	0.07%
Sodium hypochlorite(sat sol)	0.66%
Salt water – 310g/l (Sat. Sol)	0.22%
Ammonium Hydroxide-20%	nil
Nacl/water-solution -10%	nil
Wastewater anaerobic digesters	0.37%
Wastewater API mo	1.1%
B – BOND	
Bond / Adhesion to concrete (to ASTM D 4541)	> 1.5 N / Sq mm
C - ABRASION RESISTANCE	
Abrasion resistance (to ASTM D 4060 with Taber CS17-1000/1000rev)	< 15 mg loss
Shore D Hardness (to ASTM D-2240)	> 60
D - DURABALITY	
Volume solids %	100
Tear resistance (to Die Cast ASTM D 624)	> 30 KN / m
Tensile strength (to ASTM D412)	>17 N / Sq mm
Elongation (to ASTM D-412)	> 30%

Water absorption(to ASTM D 570 (2hr @95 C)	0.16
Flash Point (Pensky martin)	>93 deg C
E – SETTING TIME	< 1 minute

b) The coating shall be moisture sensitive, suitable for long term service at any temperature within the range between -10 Deg C and 100 Deg C and resistant to raw sewer, industrial sewer, treated sewer, effluents, chemicals, sea water, abrasives. The coating shall not be affected by high humidity or moisture during application.

c) All the coating materials including primer & finish coats shall be from a single manufacturer of repute certified to ISO 9002 standards having a minimum 10 years experience in similar products & in projects of similar size and value as this project.

d) The material provided shall be tested in both liquid (lab-draw down films) and field applied samples and shall meet the properties specified for the project and defined in the approved manufacturer’s product data sheet.

e) All pre-coating concrete repairs, coating and lining works shall be carried out only by experienced & reputed contractors who are authorized, approved, and certified applicators of the approved coating manufacturer & certified by the manufacturer for the type of application detailed in this project.

f) The contractor should submit, the approved coating manufacturer’s detailed Method Statement for Coating Application along with their Quality Assurance / Inspection & Testing Plan to engineer in charge prior to commencement of coating activity.

Surface Preparation & Primer application

Prior to commencement of coating activity, all concrete surfaces to be coated shall be free from oil, grease, loose particles, decayed matter, moss, curing compound residue or algal growth. All such contamination and laitance must be removed by use of abrasive sweep blasting, high pressure water jetting, or other approved manual/ mechanical means.

Concrete element’s surface irregularities, honeycombs spews must be removed and repaired by a method approved by the engineer.

Primer as recommended by the approved coating manufacturer shall be applied prior to coating application & the correct over coating time intervals shall be followed as per manufacturer’s approved method statement of application.

The coating system shall be spray applied & shall gel/set rapidly. It shall form a uniform monolithic film without any layering.

The pipes shall be coated either at pipe factory or at other department-approved coating yard prior to actual laying.

Testing:-

The finished coating shall be uniform, smooth & have a dry film thickness of minimum 1000 microns, when tested with a standard dft gauge/ Elcometer.

The dry film thickness shall be measured at points as instructed & predetermined by the engineer in charge by fixing SS strips. The coating shall be uniform, smooth & pin hole free.

Personal Safety Requirements:-

The personnel at site shall strictly adhere to Standard guidelines during the chemical coating activity, at all times. The approved coating manufacturer shall supply complete standard requirement schedules for the personnel to follow, prior to start of any coating application. The general requirements are:-

a. Observe the owners standard policy at all times and obey all written and verbal instructions from site managers and representatives.

b. Wear all PPE at all times including Hard Hat, Safety glasses, Boots, Gloves and masks as required.

c. When preparing and applying coatings and chemical materials all PPE must be worn including Gloves, safety glasses and protective paper masks.

d. When using high pressure plural component spray equipment, all personnel working in the application area must wear double filter breathers with OSHA or of atleast equivalent make.

B). P.V.C. LINING FOR RCC PIPES:

Scope of work for PVC lining in RCC pipes,

Reinforced concrete pipes of diameter 900mm and above is to be lined with PVC of minimum thickness of 1.5 mm. The lining shall be fixed to concrete surface be mechanical keys and cover complete internal circumference of the pipes. Care shall be taken to see that the resulting wall thickness, internal diameter & length of barrel does not become less than the minimum specified in IS 458. The tolerances regarding overall length, internal diameter of pipes or socket and spigot wall thickness shall be as per IS: 458. However, due to providing of PVC lining, negative tolerance for internal diameter of pipe upto maximum 3 mm is permitted.

Drawings and details indicating method of manufacture, lining, welding of joints, etc., together with test certificates of physical, chemical and biological properties of the PVC shall be submitted for Engineers in charge’s approval prior to manufacturing of any pipe.

The internal surface (PVC lining and unlined concrete surface) of the pipe shall be free from wrinkles, bulges, corrugations, burnt surfaces and imperfection. The lining shall be firmly keyed into the concrete with the back face of the lining flush against the concrete surface. The keys shall be continuous and capable of withstanding a back pressure of not less than 0.48 N/ mm2. Partially embedded keys will not be acceptable. There must be complete bonding in all welds.

Only pipes manufactured and lined to the satisfaction of the Engineers in charge are acceptable. Minor defects may be repaired with approval of Engineers – In charge but each defect must be made good to the complete satisfaction of the Engineer in Charge who reserves the right to reject any pipe (or pipes) which in his opinion do not comply with this Specification and the required standard.

Approved PVC lining should not be less than 1.5 mm thickness. In the event of the PVC lining being damaged during the construction of the sewer, the whole pipe shall be replaced entirely at the Contractor’s expense.

When pipes are laid, care shall be taken to keep the cover flaps clear of the adjoining pipe socket and to place the pipe in the correct position so that the PVC sheeting is evenly divided by the vertical pipe centre line.

At regular intervals the Contractor shall arrange for his pipe supplier to visit the site and weld up and test the PVC joint flaps and end cover fillets. Not more than three (3) pipes shall be laid before the joints are welded up.

The Contractor will be required to afford all necessary assistance in keeping the pipes clear of mud and water during the jointing of the PVC flaps.

The Contractor will be required to make arrangements for the supply of water and power and for the proper ventilation of the pipeline during cleaning, tacking and welding and testing of the PVC joints.

On completion of the laying, jointing and welding, the Contractor will be required to carry out a detailed inspection and test of the PVC lining and joint welding in the presence and to the satisfaction of the Engineer in charg

Physical & chemical properties & testing methods.
TABLE A – PHYSICAL PROPERTIES

Property	Allowable Standard		Method
Tensile Strength	Longitudinal	17.25 Mpa	ASTM D 638
	Transverse	17.25 Mpa	
Elongation at break	Longitudinal	225%	ASTM D 638
	Transverse	225%	
Hardness	54-62		Din 535.5
Plasticier Permanence	0.4%		ASTM D 1203
Water Absorption	0.1%		ASTM D 570
Water soluble matter	0.05%		ASTM D570
Porosity	No pin holes		Spark Tester 7 KV

TABLE B – CHEMICAL PROPERTIES

Chemical Agent	Test Method	Change in Weight Not more than
Sodium Hypo–Chloride 1%	ASTM D 543 (7 days at 20 degree C)	0.20%
Ferric Chloride 1%		0.60%
Sodium Chloride 5%		0.15%
Sulphuric Acid 20%		0.12%
Nitric Acid 1%		0.20%
Sodium Hydroxide 5%		0.10%
Ammonium Hydroxide 5%		0.40%
Soap & Detergent Solution 2%		0.40%

4.2. Testing of pipes at manufacturing unit.

During manufacture, tests on concrete shall be carried out as per IS: 456, IS 458 / relevant IS with latest revisions and amendments.

The specimen of pipes shall be tested in accordance with clause 1.2.8 of this Technical specification and with IS: 458 and tested in accordance with the methods described in IS: 3597 including the following,

1. Hydrostatic test.

Executive Engineer
Water Supply & Sanitary Division(SE-2)
2nd floor, 34th cross, 11th main,4th 'T'block
Jayanagar, Bangalore-5600041
Phone: 080-22945389

2.

3. Three edge bearing test

4. Absorption test.

4.3. Marking

Marking shall be done as per IS: 458 or any other relevant IS codes approved by the Engineer. The following information shall be clearly marked on each pipe,

a). Internal diameter of pipe.

b). Class of pipe.

c). Date of manufacture and

d). Name of manufacture or his registered trade-mark or both.

a. Carting & Handling

Carting and handling of RCC pipes and fittings shall be in accordance with the clause 3.4. of GSW pipes specifications.

b. Trenching.

Trenching includes all excavation which shall be carried out either by hand or by machine and shall be carried out in accordance with all requirements of Earth work excavations clause 2.0 to 2.17. Wherever a socket or collar of pipe or fitting / special occurs, a grip is to be cut in the bottom of the trench or concrete bed to a depth of at least 75 mm below the bed of the pipe so that the pipe may have a fair bearing on its shaft and does not rest upon its socket. Such grip shall be of sufficient size in every respect to admit the hand all round the socket in order to make the joint, and the grip shall be maintained clear, until the joint has been approved by Engineer.

c. Bedding

Necessary bedding (granular, concrete cradle, concrete arch etc.) shall be provided in accordance with approved construction drawings and specifications in the following clauses 6.1. to 6.1.5 of this specifications before laying of RCC sewer pipes.

d. Laying of the pipe

Laying of concrete pipes shall conform to the Code of practice of IS: 783. Pipes shall be laid underground with a minimum earth cover of 1m. Pipes shall be generally laid in sections as per standard practices and as directed by the Engineer. The RCC pipes shall be laid with sockets facing up the gradient, on desired bedding. All pipes shall be laid perfectly true, both to line and gradient. At the close of each day’s work or at such other times when the pipe is not being laid, the end of the pipe should be protected by a close fitting stopper. All pipes, fittings and material shall be tested and approved by the Engineer before being laid. Any pipes, fittings or material placed before they are tested and approved shall be removed and replaced with tested and approved material. Before laying the pipe, necessary bedding shall be provided wherever required as per Sub-Clauses 6.1. to 6.1.5 of this section.

e. Jointing of pipes

The pipe joints shall be flexible joints, jointed by rubber ring of type 'IA', as per IS 783-1985. The sections of the pipe shall be jointed in such a manner that there shall be as little unevenness as possible along the inside of pipe. Care should be taken while jointing to provide the correct gap between the end of spigot and back of the socket to ensure flexibility at each joint and correct location. The joints shall be finished as directed by the Engineer.The quality of rubber rings, tolerances, etc., shall be in conformity with IS 5382-1985 and latest revisions.After jointing, extraneous material, if any, shall be removed from the inside of the pipe.

f. Measurement of pipes

The length of the sewer pipes shall be measured between the inner surfaces of consecutive manholes at the invert level of the pipes along the central line of pipeline to the nearest centimeter.

g. Testing at work site.

After laying and jointing of pipes is completed, the pipe line shall be tested at work site as per all the requirements in clause 9.0 to 9.5 of this specifications and as approved by the Engineer.

h. Backfilling.

Backfilling shall be in accordance with requirements specified in clause 6.3 to 6.3.4. of backfilling.

5.0 DUCTILE IRON (DI) PIPES.

5.1. Manufacture of pipe

DI pipes and fittings (Class K7/K9) shall be in accordance with IS: 8329 and IS: 9523. Pipes and fittings shall be procured from reputed manufacturers with Engineer's approval. Engineer shall at all reasonable times have free access to the place where the Pipes and fittings are manufactured for the purpose of examining and testing the pipes and fittings and for witnessing the test and manufacturing.

All tests specified either in this specification or in the relevant Indian Standards specified above shall be performed by the Manufacturer / Contractor at his own cost and in presence of Engineer if desired. For this, sufficient notice before testing of the pipes and fittings shall be given to Engineer

If the test is found unsatisfactory, Engineer may reject any or all pipes and fittings of that lot. The decision of Engineer in this matter shall be final and binding on the Contractor and not subject to any arbitration or appeal. The pipes and fittings shall be striped, with all precautions necessary to avoid warping or shrinking defects. The pipes and fittings shall be free from defects. Any defect in pipes and fittings in the opinion of Engineer shall be rejected and shall be replaced by new one.

In the case of spigot and socket pipes and fittings, the socket shall be without the centre ring. In the case of flanged pipes, the flanges shall be at the right angles to the axis of the pipe and machined on face. The boltholes shall be drilled and located symmetrically off the centreline. The bolthole shall be concentric with the bore and boltholes equally spaced. The flanges shall be integrally cast with the pipes and fittings and the two flanges of the pipe shall be correctly aligned.

a). Materials

The materials used in the manufacture of pipes and fittings shall comply with requirements specified in IS: 8329 and IS: 9523.

b). Dimensions and Tolerances

The internal diameter, thickness and length of barrel, dimensions of pipes and fittings shall be as per relevant tables of IS: 8329/IS: 9523 for different class of pipes and fittings. Each pipe shall be of uniform thickness throughout its length.

The tolerances for pipes and fittings regarding dimensions, mass, ovality and deviations from straight line in case of pipes shall be as per IS: 8329/IS: 9523.

c). Coatings

i). General

Unless otherwise specified, DI pipes and fittings shall be coated with Bitumen in accordance with relevant IS specifications. All buried DI pipes and fittings shall also have factory or site applied polythene sleeving. Coating shall not be applied to pipe and fittings unless its surface is clean, dry and free from rust. Pipe coatings shall be inspected at site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

ii). Bitumen coating

Bitumen coating shall be of normal thickness of 75 microns unless otherwise specified. It shall be cold applied compound complying with the requirements of relevant Indian standards, suitable for tropical climates, factory applied in accordance with the manufacturer's instructions.

Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

iii). Polythene Sleeving

Where polythene sleeving is specified to be applied in addition to bitumen coating, it shall comply with ISO 8180. Site applied sleeving shall be stored under cover out of direct sunlight and its exposure to sunlight shall be kept to a minimum. Pipes having a factory applied sleeving must be stored in the same conditions. Joints in the sleeving shall be properly overlapped and taped in accordance with manufacturer's instructions to provide continuous sleeving.

iv). Cement mortar lining

All pipes and fittings shall be internally lined with cement mortar in accordance with relevant IS. The cement used shall be Sulphate Resisting Cement confirming to IS: 12330. No admixtures in the mortar shall be used without the approval of the Engineer.

Pipe linings shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 11906.

5.2. Testing of pipes at manufacturing unit.

During manufacture, tests on pipes shall be carried out in accordance with clause 1.2.8 of this technical specification by the Third party inspecting agency.

5.3. Marking

Marking shall be done as per IS: 8329 and IS: 9523 or any other relevant IS codes approved by the Engineer.

The following information shall be clearly marked on each pipe,

a). Internal diameter of pipe.

b). Class of pipe.

c). Date of manufacture and

d). Name of manufacture or his registered trade-mark or both.

5.4. Carting & Handling.

Carting and handling of D.I. pipes and fittings shall be in accordance with the clause 3.4. of GSW pipes specifications.

a. Trenching.

Trenching includes all excavation which shall be carried out either by hand or by machine and shall be carried out in accordance with all requirements of -Earth work excavations clause 2.0 to 2.17. Wherever a socket or collar of pipe or fitting / special occurs, a grip is to be cut in the bottom of the trench or concrete bed to a depth of at least 75 mm below the bed of the pipe so that the pipe may have a fair bearing on its shaft and does not rest upon its socket. Such grip shall be of sufficient size in every respect to admit the hand all round the socket in order to make the joint, and the grip shall be maintained clear, until the joint has been approved by Engineer.

Wherever D.I. pipes are laid over pillar supports for nala crossings etc. the pipes shall be placed as per the construction drawings and as directed by the Engineer In-charge.

b. bedding

The type of bedding (granular, concrete cradle, concrete arch etc.) shall be as per approved construction drawings and specifications in the following clauses 6.1. to 6.1.5 of this section.

c. Laying of the pipe : NA

5.8 Jointing of pipes : NA

5.9 Measurement of pipes

The length of the sewer pipes shall be measured between the inner surfaces of consecutive manholes or start to end points of laid alignment (at road crossings and Nala Crossings) at the invert level of the pipes along the central line of pipeline to the nearest centimetre.

5.10 Testing at work site.

After laying and jointing of pipes is completed, the pipe line shall be tested at work site as per all the requirements in clause 9.1 to 9.1.4 of technical specifications and as approved by the Engineer.

5.11. Backfilling.

Backfilling shall be in accordance with requirements specified in clause 6.3 to 6.3.4. of backfilling.

7.0 ANCILLARY STRUCTURES – MANHOLES, DROP MANHOLES AND VENTILATING SHAFTS.

The Contractor shall construct Wire cut brick, RCC-Manholes, Drop arrangements with HDPE pipes, Cast iron Ventilating shafts, Valve Chambers, at the locations shown on approved construction drawings, as directed by the Engineer as per the specification in the applicable Indian standards mentioned and as mentioned hereafter. The materials used and construction procedure adopted for the ancillary structures shall comply to the specifications as mentioned below and clause in standard specifications for civil works.

7.1. Excavation

Earth work excavations for the Manholes, Drop arrangements and C.I. Ventilating shaft arrangements etc. shall be carried complying to specifications in clause 2.0 to 2.17 and specifications in bill of quantities.

7.2. Backfilling.

Backfilling for sewer ancillary structures shall be in accordance with requirements specified in clause 6.3 to 6.3.4 of Backfilling.

7.3. Manholes

Manholes shall be built at every change of alignment, gradient or diameter, at the head of all sewers and branches, at every junction of two or more sewers as shown on the drawings complying to IS: 4111 Part1-1967 and latest revisions and as per specifications in this section or as directed by Engineer. Sulphate resisting cement confirming to IS: 12330 shall be used for all the items of works for manholes. The shape of the manholes generally is circular with conical shape at top for Brick manholes, unless specifically stated as on drawings.

The Contractor shall be wholly responsible for giving suitable connections at the junctions of sewer lines with the manholes. The minimum depth of manhole shall be one meter or as in construction drawings or as directed by Engineer.

For House service connections directly to manholes, 110/160mm PVC pipes shall be placed during construction of manholes as per specifications in Clause 8.1.1. and items in BOQ, if the provisional pipes for House service connections are not placed due to the negligence of the contractor, the contractor has to redo the total work of dismantling of manhole shaft and placing of the pipes etc. at his own cost.

The Manholes have been divided into different categories based on depth, diameter and material of construction. Any manholes required to be provided extra, at the locations shown by the Engineer, shall be provided by the Contractor, for which payment shall be made at the quoted rates.

7.3.1. Wire cut Brick Manholes.

7.3.1.1. Construction.

The work shall be executed in accordance with the approved construction drawings and specifications involving,

a). Providing and constructing of 1:3:6 Cement Concrete foundation using approved quality aggregates of 40mm and downsize with an offset of 150mm all round the chamber.

b). Providing and constructing wire cut brick masonry in C.M 1:4 proportion using modular wire cut bricks of class designation 75 of approved quality and confirming to IS : 1077 with a tapering top portion as per approved construction drawings and providing cement mortar plaster in CM 1:3 proportion, 12mm thick inside and outside except for the conical surface outside, where the thickness of plaster shall be 20mm thick. Samples of bricks shall be tested as per IS : 3495 by the Contractor. Bricks rejected by the Engineer shall be removed from the site within 24 hours.Construction of Brick works shall be in accordance with IS 2212:1962 and latest revisions.

c). Providing and constructing benching with Cement Concrete 1:2:4 to the dimensions as on drawings with 1:6 slope in the concrete towards the central drain, plastered with CM 1:3 proportion, 20mm thick and finished with smooth coat of neat cement and fixing of inlet and outlet sewers in the walls with the internal periphery protected with an arch of 1:2:4 Cement Concrete with graded metal of 10mm to 20mm size.

d). Supplying and fixing of, 3 mm thick plastic (as per IS: 10910) encapsulated over 12mm dia. Fe-415 steel (as per IS: 1786) bar footsteps staggered at 300mm apart and providing and fixing of heavy duty circular steel fibre reinforced concrete (SFRC) manhole frame and covers of 560 mm diameter conforming to IS 12592 and the payment for providing of SFRC heavy duty manhole frame and covers shall be paid separately as per quoted rate for the item in bill of quantities.

e). The channel for the manhole shall be constructed in cement concrete of M15 grade. Both sides of the channel shall be taken up to the level of the crown of the outgoing sewer. They shall be benched up in concrete and rendered in cement mortar (1:1) of 20 mm thickness and formed to a slope of 1 in 12 towards the channel.

f). The manhole construction work includes curing, pouring tar over MH frame and cover, cost of tar, engraving manhole number and flow direction on the inner surfaces etc., with all lead and lifts, finishing etc complete. The cement used for the construction of masonry works and internal & external plastering works of manholes shall be of sulphate resisting cement only confirming to IS:12330.

7.3.1.2. Testing.

All Brick Manholes shall be tested as per relevant provisions in CPHEEO Manual & relevant IS with latest revisions & amendments and specifications in clause 9.0 of Testing and commissioning.

7.3.1.3. Measurement & payment.

The depth of manhole shall be measured from the top of cover to the invert level of the deepest outgoing sewer from the manhole.The quoted rate for the Manholes for various depths as per the specifications and drawings shall include the cost of sulphate resisting cement, bedding concrete, benching concrete, wire cut brick masonry, plastering, foot steps, fixing SFRC manhole frame with cover, dewatering to keep the manhole dry until final testing etc complete.

The Rates for any fractional variation (increase or decrease) in the depth of the manhole on decimetre basis, shall be paid as per actuals, by adding the difference in rates between the immediately preceding and succeeding depths of such fractional depth of manhole on linear basis.

For Example: To pay 1.22M depth manhole:

Rate for 1M depth Manhole excluding manhole frame & cover and including encapsulated foot steps rate Rs. X.

Rate for 2 M depths Manhole excluding manhole frame & cover and including encapsulated foot steps rate Rs. Y.

Therefore rate for 1.22M depth Manhole

= Rs. X + (Y-X)/1.00 x 0.22.

Note: For the depths of manholes less than the lowest depths of Bill of Quantities item, the preceding manhole depth shall be taken as zero with zero value to arrive at the rate

7.3.2. RCC Manholes.

7.3.2.1. Construction.

The construction of RCC manholes shall be by Cast In-situ of Circular in shape or approved type Pre-Cast RCC, constructed using form vibrators of standard type, using SRC Cement confirming to IS: 12330. The type of manhole to be constructed shall be as approved by BWSSB, Contractor shall take prior approval for the Design and Process of manufacture of the Pre-cast RCC manholes, the type of vibration for compaction of concrete for pre-cast manholes shall be invariably of form or table vibrator type.

The work of Cast In-situ RCC manholes includes,

a). Providing and constructing of 1:3:6 Cement Concrete foundation using approved quality aggregates of 40mm and downsize with an offset as given in the drawings.

b). Providing and laying granite jelly cement concrete 1:1.5:3 for beds of manholes etc., using 20mm and down size jelly including laying, tamping, etc. for a depth, as per drawings, with water proof compound for top plaster in CM 1:3 curing and smooth finishing for exposed faces with necessary centering and form work etc., complete as per specification, drawing and as directed by the Engineer.

c). Providing and laying cement concrete of 1:1.5:3 proportion for vertical walls using 20mm and down size jelly including laying, tamping, mixing of required quantity of water proof compound for every one bag of cement for plastering in CM 1:3 curing and smooth finishing for exposed faces with necessary centering and form work etc., complete as per specification, drawing and as directed by the Engineer.

d). Providing and constructing benching with Cement Concrete 1:1.5:3 to the dimensions as on drawings with 1:6 slope in the concrete towards the central drain, plastered with CM 1:3 proportion, 20mm thick and finished with smooth coat of neat cement and fixing of inlet and outlet sewers in the walls with the internal periphery protected with an arch of 1:1.5:3 Cement Concrete with graded metal of 10mm to 20mm size.

e). Providing and laying cement concrete of grade 1:1.50:3 proportion with 12mm to 20mm I.S.I gauge of approved gradation hard broken granite/aggregate including cost and conveyance of all materials with wood or steel shuttering form work including machine mixing , centering form work, scaffolding, tamping , vibrating , curing and smooth finish with CM 1:3, 12mm thick for inside surface for RCC Covering Flat Slab with all lead and lifts, etc. complete as per drawing, specification and as directed by the Engineer.

f). Providing, Supplying and fabricating of TMT (Fe-500) reinforcement steel of all sizes, including straightening, cutting, bending, hooking, lapping and/or welding wherever required, placing in position, tieing with binding wire of approved quality and gauge including the cost of binding wire and anchoring to adjoining members wherever necessary including all laps and wastages etc., with all lead and lifts, complete as per design, specification and directed by Engineer.

g). Supplying and fixing of, 3 mm thick plastic (as per IS: 10910) encapsulated over 12mm dia. Fe-415 steel (as per IS: 1786) bar footsteps staggered at 300mm apart and providing and fixing of heavy duty circular steel fibre reinforced concrete (SFRC) manhole frame and covers of 560 mm diameter conforming to IS 12592 and the payment for providing of SFRC heavy duty manhole frame and covers shall be paid separately as per quoted rate for the item in bill of quantities.

h). The RCC Manhole cost includes all materials, steel, curing, pouring tar over MH frame and cover, cost of tar, engraving manhole number and flow direction on the inner surfaces etc., with all lead and lifts, finishing etc complete. The cement used for the construction of RCC manhole and internal & external plastering works of manholes shall be of sulphate resisting cement only, confirming to IS:12330.

The work of construction of Pre-cast RCC manhole includes,

a). Providing & laying mechanically mixed cement concrete of M-15 grade with stone aggregate (with 20 mm nominal size graded stone aggregate) in benching, Neat cement punning over PCC benching, as given in the drawings.

b). Construction of approved type vibrated Pre-Cast RCC Manhole Chambers constructed using Sulphate resistant Cement & form vibrator of standard type for Circular Manhole Chambers of various internal dia (as indicated in BOQ) at bottom and 0.50 dia at top made up of pre-cast monolithic base, modular riser and top cone in M- 30 grade concrete placed & aligned to provide vertical sides, with O ring rubber gasket at each joint, water tight & adjustment rings over top cone, complete and all connections shall have, a water tight seal between the pipe and the manhole complete as per standard design & drawing.

c). Making connection of drain or sewer line with existing manhole including breaking in to and making good the walls, floors etc. with CC 1:1:5:3. Finishing with CM 1:3 with a floating coat of neat cement and making necessary channels for drain etc. as per specification, drawing and as directed by the Engineer.

d). Providing, Supplying and fabricating of TMT (Fe-500) reinforcement steel of all sizes, including straightening, cutting, bending, hooking, lapping and/or welding wherever required, placing in position, tieing with binding wire of approved quality and gauge including the cost of binding wire and anchoring to adjoining members wherever necessary including all laps and wastages etc., with all lead and lifts, complete as per design, specification and directed by Engineer.

e). Providing MS Foot rests and fixing in manhole with CC Block of 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate of 20 mm nominal size) of size 20x20x10 cm with 20mm square bar foot rest, and providing and fixing of heavy duty circular steel fibre reinforced concrete (SFRC) manhole frame and covers of 560 mm diameter conforming to IS 12592 and the payment for providing of SFRC heavy duty manhole frame and covers shall be paid separately as per quoted rate for the item in bill of quantities.

f). The RCC Manhole cost includes providing danger lighting & use of sight rails & boning roads shoring & strutting wherever required, including sand bedding, watering, curing, cost of all materials, labour, supply & fabrication of steel, pouring tar over MH frame and cover, cost of tar, engraving manhole number and flow direction on the inner surfaces etc., with all lead and lifts, finishing etc complete. The cement used for the construction of RCC manhole and internal & external plastering works of manholes shall be of sulphate resisting cement only, confirming to IS:12330.

7.3.2.2. Testing.

All RCC Manholes shall be tested as in specifications in clause 9.1.3. of Testing of manholes.

7.3.2.3. Measurement & payment.

The depth of manhole both for Cast In-Situ / Pre-Cast RCC manholes shall be measured from the top of cover to the invert level of the deepest outgoing sewer from the manhole. The quoted rate for the Manholes for various depths as per the specifications and drawings shall include the cost of sulphate resisting cement, bedding concrete, benching concrete, RCC floor & roof slab, shaft walls, plastering, foot steps, fixing SFRC manhole frame with cover, dewatering to keep the manhole dry until final testing etc complete.

The Rates for any fractional variation (increase or decrease) in the depth of the manhole on decimetre basis shall be paid as per actuals, by adding the difference in rates between the immediately preceding and succeeding depths of such fractional depth of manhole on linear basis.

For Example: To pay 1.22M depth manhole:

Rate for 1M depth Manhole excluding manhole frame & cover and including encapsulated foot steps rate Rs. X.

Rate for 2 M depths Manhole excluding manhole frame & cover and including encapsulated foot steps rate Rs. Y.

Therefore rate for 1.22M depth Manhole

= Rs. X + (Y-X)/1.00 x 0.22.

Note: For the depths of manholes less than the lowest depths of Bill of Quantities item, the preceding manhole depth shall be taken as zero with zero value to arrive at the rate.

7.4. Drop Manholes.

In a manhole, wherever the difference between the invert level of downstream sewer and the invert level of the upstream sewer is greater than

60 cm, a drop manhole shall be provided at that position. The locations and construction of the drop manholes shall be provided as on drawings.

HDPE Grade PE-100 pipes confirming to PN 6 as per IS:4984 with latest revisions and amendments suitably supported with MS fasteners at 300 mm c/c. for diameters pipe line as per Bill of Quantities, construction drawings and as directed by Engineer, specials conforming to IS: 1729 shall be used for providing the drop in the manhole & a suitable expander/reducer T-Joint at the top with incoming sewer and 45 degree bend at the bottom with HDPE specials to the direction of flow in the receiving sewer, encasing the pipe with cement concrete of 1:2:4 proportion including necessary centering and form work, vibrating, curing, including cost and conveyance of all materials, labour with all lead and lifts, etc., complete as per specification and as in construction drawing. The benching concrete in the manhole should surround the joint of the terminating bend and a neat channel shall be made in the benching concrete to direct the flow to the receiving sewer. A continuation of the incoming sewer should be built through the shaft wall to form a rodding and inspection eye, which should be provided with half blank flange as on drawing. The drop manhole arrangements shall be tested along with sewer lines.

7.5. Vent shafts.

CI Vent shafts shall be erected at places as on construction drawings or as directed by Engineer and as per Bill of Quantities. The work includes providing and fixing 150mm diameter, Cast Iron pipe for ventilating shaft of 5 meters high with specials and cowl and with suitable grips in C.C. 1:2:4 pillar using 10mm to 20mm graded hard granite/trap/basalt or any other approved metal with 15 cms thick C.C. around up to 1.22 mtrs above the GL and with a foundation base of 90x90x90 cms plastered with 12 mm thick CM 1:3 to all exposed faces and linking the shaft to the manhole by means of 15 cm dia GSW pipes and specials, jointing with tar dipped hemp 1:1 1/2 CM caulking, curing with all lead and lifts etc., complete for all materials earth work excavation and refilling in all strata, and disposal of surplus earth as directed with all lead and lifts etc. complete.(Sulphate resistant cement shall be used).

9.0. TESTING AND COMMISSIONING.

9.1. Testing at site.

All sewers and appurtenances shall be tested before commissioning and trial run as per the specifications in this section. After laying and jointing of sewer pipes and before backfilling the trenches, the complete length of the sewer is to be checked for water tightness and the sole responsibility of arranging the necessary equipments and apparatus lies with the contractor at his own cost. Any damage during testing shall be contractor’s responsibility and shall be rectified by him free of cost. Water for testing shall be arranged by the Contractor at his own cost.

9.1.1. Water Test for Sewers.

After laying and jointing of sewer pipes and before backfilling the trenches, the complete length of the sewer is to be checked for water tightness. Employer may exempt water test for lateral sewers, where house service connections are to be connected immediately to lateral sewers.

The procedure for testing is as detailed below,

Each section of sewer shall be tested for water tightness from manhole to manhole To prevent change in alignment and disturbance after the pipes have been laid, it is desirable to backfill the pipes up to the top keeping at least 90cm length of the pipe open at the joints in case of longer length pipes.

In case of concrete and stoneware pipes with cement mortar joints, pipes shall be tested three days after cement mortar joints have been made. It is necessary that the pipelines are filled with water for about a week before commencing the application of pressure to allow for the absorption by pipe wall.

The sewers are tested by plugging the upper end with a provision for an air outlet pipe with stop cock.. The water is filled through a funnel connected at the lower end provided with a plug. After the air has been expelled through the air outlet, the stop cock is closed and the water level in the funnel is raised to 2.50m above the invert at the upper end. Water level in the funnel is noted after 30 minutes and quantity of water required to restore the original water level in the funnel is determined. The pipeline under pressure is then inspected while the funnel is still in position. There shall not be any leaks in the pipe or the joints (small sweating on the pipe surface is permitted). Any sewer or part there of that does not meet the test shall be emptied and repaired or re-laid as required and tested again.

The leakage or quantity of water to be supplied to maintain the test pressure during the period of 10 minutes shall not exceed 0.2 lit/mm dia. of pipe per kilometer length per day.

Exfilteration test for detection of leakage shall be carried out at a time when the ground water table is low.

For concrete, R.C.C. pipes of more than 600mm dia. the quantity of water inflow can be increased by 10% for each additional 100mm of pipe dia.

After completion of the test all temporary seals shall be removed, the test water shall be drained out / pumped out and the line cleaned properly.

9.1.2. Test for Straightness and obstruction

As soon as a stretch of sewer is laid and tested, before commissioning the cleanliness of the pipeline is to be checked by the following tests as applicable and as decided by the Engineer.

a). Torch & Mirror Test

In this method of testing, a torch will be held one end of the pipeline inside a manhole and its image through the pipeline will be reflected and seen on a mirror held at the opposite end of the pipeline, inside the next manhole. Any obstruction / debris / major mis-alignment will not give a clear image in which case the pipeline will again be cleaned / rectified and the tests re-done.

b). Ring Test

In this method of testing two steel/ wooden rings of suitable thickness and design shall be fixed facing each other at a distance of 2 feet or more. The block of rings shall be inserted from one end of the pipeline, inside manhole and pulled by a rope fixed to the block from the other end of the pipeline, inside the next manhole. The rings shall be of dia 75 mm less than the inside diameter of pipe under testing. The rope used for pulling the ring block may be inserted in the pipeline by suitable means. Any construction / debris / major misalignment will prevent the ring to pass through the pipeline in which case the pipeline will again be cleaned / rectified and the test redone, and no extra payment will be made. Alternately upon the approval of the Engineer, the sewer may be tested by inserting at the high end of the sewer, a smooth ball of a diameter 13 mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lower end. Any construction / debris / major misalignment that prevent the ball to pass through the pipeline in which case, the pipeline shall be again cleaned / rectified and the tests redone, and no extra payment will be made.

9.1.3. Water Test for Manholes.

The entire height of Brick and RCC manhole shall be tested for water-tightness by closing both the incoming and outgoing ends of the sewers and filling the manhole with water. A drop in water level not more than 50mm per 24 hours shall be permitted. In case of high subsoil water it should be ensured that there is no leakage of ground water into the manhole by observing the manhole for 24 hours after emptying it.

9.1.4. Test Records

Complete test records shall be maintained for all tests carried out for sewers both during construction and after being in service. The tests carried out as in specifications, approved QAP shall be documented in the formats as approved by the Engineer and shall be carried out in the presence of the Engineer or his representative and shall be certified by the Engineer or his representative and the Contractor. All completed Test records/documents shall be submitted to the Engineer before submission of bills.

9.2. Commissioning

After satisfactory completion of works and Testing of the sewer lines and appurtenances as per specifications in above clauses, the system shall be commissioned for trial run and operation.

9.3. Final Finishing

The contractor will ensure that the entire structure along with all its installations is in finished and in new and fully operative condition when handed over. He shall have repaired and removed all signs of damage that might have been done during the course of construction of manholes and laying of sewers. He shall also see that the entire exterior has been finished properly and the entire site is cleared of all extra construction material, debris, and excavated soil. This shall have to be done to the satisfaction of the Engineer.

9.4. As Built Drawings

The contractor shall submit to the Engineer within two months of actual completion of the work, “As Built” Drawings as specified below and operation and maintenance instructions for the whole of the Works. These Drawings shall be accurate and correct in all respects, including the existing sewer network for which the contractor has done the condition assessment survey, shall be submitted to, and approved by the Engineer. Completion Drawings as below on two prints and one polyester film shall be supplied by the contractor, along with a soft copy in CD. These drawings shall be developed in Auto CAD. Drawing shall be of standard size as below,

i). Strip Plans and L-sections of Under Ground Drainage system showing pipe work in package area on scale as per standard practices to the satisfaction of the Engineer, showing sewer alignments, levels, appurtenances, sizes and material of pipe etc. complete.

ii). Structural Drawings showing reinforcement details of all the components covered under this contract as per standard practices.

11.2. PRIMING OF BASE COURSE WITH BITUMINOUS PRIMERS

11.2.1 Scope

This specification relates to the operation of priming an absorbent base course, preparatory to a subsequent bituminous treatment, through application of a low viscosity bituminous material by spraying. The specification is intended to indicate what is considered to be a good practice for priming and shall apply unless modified by special provisions to take into account any unusual conditions.

The scope involves, Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base of low porosity such as WBM including clearing of road

surface and spraying primer at the rate of 0.75 kg/sqm using mechanical means. As per MORTH specification clause No. 502 complete in all respects with all lead & lifts etc complete.

11.2.2 Materials

The bituminous primer to be used should be such that it can penetrate into the base course to perform its intended function.

11.2.3. Types of primer

Table 11.2.1 can be used as guidance for choice of primer on different types of surfaces.

Table 11.2.1 Guidelines for choice of primer

Type of Surface	Emulsion	Cut-back		Road tar
Low porosity	Not suitable	MC-0		RT-1 or RT-2
Medium porosity	SS or MS	MC-1 orSC-1	MC-2 or SC-2	RT-2 or RT-3
High porosity	MS	MC-3 or RC-1		RT-3 or RT-4

The primers shall conform to IS: 8887 – 1978 (for cationic emulsions), IS: 217-1961 (for cut-backs), and IS: 215-1981 (for road tars), as applicable.

11.2.4.Viscosity

For selecting the appropriate type of primer out of the materials indicated in Table 1, the atmospheric temperature during application should be given consideration. Also, within the range of viscosity specified, the primer for use may be selected keeping in view the level of porosity of the surface to be treated.

11.2.5. Quantity of primer

The primer shall be applied at the rate of 0.75 kg/sqm.

11.2.6. Construction

a. Weather and seasonal limitations

Cut-back and road tar primers shall not be applied on wet surface or during dust storm or when the weather is foggy or rainy. Bitumen emulsion can be applied on wet surface. However, emulsions shall not be applied during dust storm or when it is actually raining.

Atmospheric temperature during priming should be above 10° C.

b. Equipment

All equipment required for the execution of work should be in good working condition at site.

c. Preparation of base course surface

The base course surface to be primed shall be swept clean and free from dust. All loose materials and other foreign matter on the surface shall be removed completely, if necessary by using power blowers or sweepers.

Large irregularities, potholes, depressions, etc. shall be repaired prior to priming. Minor depressions may be ignored until the surface is primed. After which these might be patched with a suitable premixed material prior to the subsequent bituminous treatment.

The underlying surface shall be dry prior to priming. Except that in the case of bitumen emulsions, it may be desirable to dampen the surface slightly in order to obtain better penetration of the primer.

Pre-wetting should be done by water spraying, using equipment capable of uniform application of water over the entire surface. The spraying may be taken up 2 to 12 hours before priming, in such quantity that the surface during priming is damp but not saturated with water. Traffic shall be kept off the prepared areas prior to priming.

d. Application of primer

After the base to be primed has been prepared as described above, the primer shall be uniformly applied over the surface using mechanical sprayers. Rate of application of primer shall correspond to the quantities given in clause 11.2.5.

The spraying should preferably be carried out using sprayer mounted on distributor truck or with hand sprayer using mechanical pump. The use of hand-held containers such as watering cans, perforated buckets etc., is unacceptable and should not be permitted under any circumstances. Quantity should be checked periodically using Tray Coating Test or any other suitable means.

Temperature of application of primer should be high enough to permit the primer to be sprayed effectively through the jets of the spray bar and to cover the base course surface effectively.

e. Curing

The primed surface shall be allowed to cure fully. No traffic shall be allowed over the primed surface during this period and in any case not before 24 hours if the primer is a cut-back bitumen and 6 hours in the case of bitumen emulsion. Any pool of excess cut-back primer, which has not been completely absorbed by any part of the base course surface during the curing period, should be carefully swept over the adjacent surface, and then a light sand blotter course applied. The amount applied should be just sufficient to blot up the excess bitumen and prevent it being picked up under traffic. If an excess of bitumen residue is found on the primed surface after bitumen emulsion has broken, a very light sand dusting may be applied to soak up the surplus material.

All loose sand should be swept from the base course surface prior to any subsequent bituminous treatment.

11.3. Tack Coat

All specifications in the clause 11.2.6 shall apply to this item of work and the specific scope of work involves Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.375 kg/sqm on the prepared granular surface cleaned with mechanical broom such as WBM surface as per MORTH specification clause No. 503 complete in all respects with all lead & lifts etc complete for old surfaces at vertical and horizontal joints.

11.4. SPECIFICATIONS FOR SINGLE COAT BITUMINOUS SURFACE DRESSING (20MM THICK PRE-MIX BITUMINOUS SURFACING).

11.4.1. Scope.

This specification is intended to indicate what is considered to be good practice for construction of single coat bituminous surface dressing and shall apply unless modified by special provisions to take into account unusual conditions. The work specified consists of a wearing surface composed of a single application of bituminous material covered with one application of cover material of size as specified below, applied on a previously prepared base or pavement.

The specific scope involves, Providing, laying and rolling of open-graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen 80/100 or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades. Mechanical method using Penetration grade Bitumen and HMP of appropriate capacity, as per MORTH specification No.511 complete in all respects. (Bitumen 1.46kg/sqmt. Metal = 0.027) with 40-60 TPH hot mix with all lead & lift etc complete.

11.4.2. Materials

a. Bituminous materials - The bituminous materials shall be of grade 80/100 or cut-back conforming to the requirements as specified and provided for in the proposal and satisfy the related specification, issued by the Indian Standards Institution (vide I.S.I Standards 73-1961,215-1961,217-1961 and 454-1961).

b. Cover materials

(i). General requirements - The cover material shall consist of crushed stone, crushed slag crushed gravel (shingle) or other stones, as specified, and shall have clean, strong, durable, and fairly cubical fragments free from disintegrated pieces, salt, alkali, vegetable matter, dust and adherent coatings. The aggregate shall preferably be hydrophobic in nature and of low porosity.

(ii). Physical requirements - The aggregate shall satisfy the requirements given in Table 11.4.1.

Table 11.4.1

Sl. No.	Property	Value	Method of test

	Abrasion value, using Los Angeles machine or	Max. 35%	IS: 2386 (Part IV)
	Aggregate impact value	Max. 30%	- do -
	Flakiness index	Max. 25%	IS: 2386 (Part I)
	Stripping value	Max. 25%	IS: 6241
	Water absorption (except in case of slag)	Max. 1%	IS: 2386 (Part III)
	Soundness: Loss with sodium sulphate – 5 cycles (in case of slag only)	Max. 12%	IS: 2386 (Part V)
	Unit weight or bulk density (In case of slag only)	Min. 1120 kg per m^3	IS: 2386 (Part III)

Where all these conditions cannot be satisfied, it is left to the Engineer-in-charge to allow reasonable tolerances.

Size - The size of chippings to be used shall depend on whether the treatment is for the first coat or for the subsequent or renewal coat and shall be as per the size specified below. For single application of the aggregate, it is desirable to keep the grading of the various sizes as specified in Table 11.4.2.

Table 11.4.2

	Sieve designation nominal size of aggregate	specification
	For surfacing water-bound macadam - first coat	100 percent passing through 20 mm square mesh sieve and retained on 10 mm square mesh sieve
	For subsequent or renewal coats 10 mm	100 percent passing through 12.5 mm square mesh sieve and retained on 6.3 mm square mesh sieve.

Note – It is essential to sieve the aggregates through proper size sieves to ensure the size stipulated in the specifications. The sieve sizes indicated above are as per IS: 460 – 1962.

11.4.3. Construction methods

a. Weather and seasonal limitations - Preferably, the surface dressing work shall be carried on only when the atmospheric temperature in shade is 16°C or above. No bituminous material shall normally be applied when the surface or the cover material is damp, when the weather is foggy or rainy or during dust storm, except, in case of emulsions, the surface should be slightly damp.

b. Equipment - All equipment necessary for the proper construction of work shall be on the site of the work in good condition.

c. Preparation of road surface - The underlying course on which surface dressing is to be laid shall be prepared, shaped and conditioned to a uniform grade and section as specified. Any depressions or pot-holes shall be properly made up and thoroughly compacted sufficiently in advance. The defective parts should be clearly cut out and the patches of new material put in, and not put on the existing surface.

Where the existing surface shows signs of "fatting-up", such position should be rectified. It is important that the surface be dry and thoroughly cleaned immediately before applying the binder. The surface should be swept clean free of caked earth and other foreign matter cleaned first with hard brushes, then with softer brushes and finally blowing off with sacks or gunny bags to remove the fine dust. The base shall be applied with Tack coat as per clause 11.4.uniformly preferably by a mechanical sprayer.

d. Application of bituminous material - After the surface to be treated has been prepared, as specified above, bituminous material shall be sprayed uniformly over the dry surface preferably using mechanical sprayers. The binder shall be applied at a temperature appropriate to the type of binder and equipment used. The premix open graded surfacing consisting of aggregates 13.2mm to 5.60mm shall be applied to an uniform thickness as per applicable IS standards to get the final compacted thickness of 20mm.

e. Rolling cover materials - Immediately after the application of the cover materials as described, the entire surface shall be rolled with a 8 to 10 tonne smooth wheeled road roller. The rolling shall begin at the edge and proceed lengthwise, over the-area to be rolled lapping not less than one third of the roller tread and proceed towards the centre. When the centre is reached, the rolling shall then start at the opposite side and again proceed towards the centre. In the super-elevated portions, the rolling should proceed from the inner to the outer edge. While the rolling is in progress, additional aggregate shall be spread by hand in whatever quantities may be required to fill irregularities and to prevent picking up of the aggregate by the roller. Rolling shall be continued until the particles are firmly embedded in the bituminous materials and present a uniform closed surface. Excessive rolling which results in the crushing of the aggregate particles shall be avoided.

f. Finishing - The finished surface shall be uniform and conform to the lines, grades and typical cross sections shown in the specifications.

g. Opening to traffic - When straight run bitumen or road tar is employed as the binder, the finished surface shall be thrown open to traffic on the following day but if in special circumstances, the road is required to be opened to traffic immediately after rolling, speed of the traffic shall be limited to 16 km per hour till the following day.

Where cutback bitumen and emulsion is employed, the finished surface shall be kept closed to the traffic until it has sufficiently cured to hold the cover aggregates in place.

Controlling of traffic shall be done by some suitable device, such as barricading and posting of watchmen, etc.

11.5. SEAL COAT.

The scope of work involves Providing and laying seal coat sealing the voids in bituminous surface laid to the specified levels, grade and cross fall using Type A seal coat as per MORTH specification clause No. 513 complete in all respects with all lead & lift etc complete.(Bitumen = 0.98 kg/sqmt. Metal =0.009).

11.6. SPECIFICATIONS FOR CONSTRUCTION OF CONCRETE ROADS

11.6.1. Scope

This is intended to indicate what is considered to be good practice for the construction of cement concrete road pavements, including preparation of the subgrade and sub -base underneath these pavements. This does not however cover the requirements of fully mechanized constructions.

The scope involves providing specified thickness of 1:3:6 proportion cement concrete as base course and specified thickness of 1:1.5:3 proportion cement concrete as wearing course as per approved construction drawings and specifications.

11.6.2 Materials

a. Ordinary Portland Cement - This should comply with the requirements of IS - 8112 with latest revisions (Specification for Ordinary Portland Cement)

b. Aggregates

General - Aggregates should comply with IS - 383 -1970 "Specification for Coarse and Fine Aggregates from Natural Sources for Concrete (Second Revision)" with special reference to the additional requirements stipulated for use in road works excepting in the case of Los Angeles Abrasion Test limit.

The Los Angeles Abrasion Test limits shall be not more than 35 per cent and 50 per cent for concrete wearing course and sub -base course respectively. In addition, the limits of deleterious material shall not exceed the requirements set out in IS - 515 -1959 “Specification for Natural and Manufactured Aggregates for Use in Mass Concrete." Weathered rock should not be used. In order to make good concrete, it is important to avoid crushed aggregate of poor shape. Very angular, flaky, elongated or splintery aggregates give a harsh mix of low workability. Maximum size of aggregate should not exceed l/4th of the pavement slab thickness. In case of pavements having reinforcement, maximum size of aggregate should also not exceed l/4th of minimum clear spacing between reinforcing bars.

c. Coarse aggregates

Continuous grading - Continuously graded coarse aggregate should be furnished in at least two separate sizes with separation at 20 mm I.S. sieve when combined material graded from 40 to 4.75 mm is specified, and at 25 mm I.S. sieve when combined material graded from 50 to 4.75 mm is specified.

d. Fine aggregate - Fine aggregate shall preferably be natural sand. Crushed stone sand may also be used satisfactorily in concrete. The fine aggregate shall conform to IS: 383 -1970, the permissible percentage passing limits on 300 and 150 -micron sieves shall be 15 -55 per cent and 0 -20 per cent respectively instead of 15 -50 percent and 0 -15 per cent as stipulated in IS Specification. Crushed sand is usually more angular in shape than naturally occurring sand, and for this reason may tend to make the mix a little harsher. In some cases, it may prove advantageous to use a mixture of naturally occurring sand and crushed stone sand if the former is not obtained in adequate supply or where its grading is poor. Bulking due to presence of moisture in the fine aggregate should be accounted for when volumetric batching is employed.

e. Water - Water used in mixing or curing of concrete shall be clean and free from injurious amounts of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in clauses of IS: 456 -2000 "Code of Practice for Plain and Reinforced Concrete". Potable waters are generally considered satisfactory for mixing or curing.

f. Dowel and tie bars - Dowel and tie bars shall be plain round steel bars conforming to the requirements of IS: 432 -1966.

g. Premoulded joint filler - Premoulded joint filler shall be of the thickness shown on the drawings within a tolerance of ±1.5 mm. It shall be 25 mm less in depth than the thickness of the slab, within a tolerance of ±3 mm and of the full width between road forms. Holes to accommodate dowel bars shall be accurately bored or punched out. The joint filler shall comply with the requirements of IS: 1838 -1961 "Specification for Preformed Fillers for Expansion Joint in Concrete, Non -extruding and Resilient Type (Bitumen -impregnated Fiber)."

11.6.3. Water content and workability

The water content per batch of concrete should be maintained constantly except for suitable allowances to be made for free moisture and absorption by aggregates determined from time to time during construction. Adjustments for workability shall be made by variations in the ratio of the coarse to fine aggregate or improving upon their grading without change in cement content or water -cement ratio. The slump of the concrete mix for pavements compacted by vibration should not be more than 25 mm, preferably between 0 and 12 mm, and that by manual compaction not more than 50 mm. No price adjustment would be permissible for variations in the gradations of the aggregates or in the ratio of coarse to fine aggregates necessitated from adjustment at site.

11.6.4. Tools, equipment and appliances

General

All tools, equipment and appliances necessary for proper preparation of sub-grade, laying of sub -base and batching, mixing, placing, finishing and curing of concrete shall be at the project site in good working condition and shall have been inspected by the engineer before the paving operations are permitted to start. Throughout the construction of the project, the construction agency shall maintain all necessary tools, equipment and appliances in first class working condition to ensure proper execution of the work. Arrangements shall also be made for requisite number of stand -by units in the event of break -downs during construction.

11.6.6. Forms

Steel forms - All side forms shall be of mild steel unless use of wooden sections is specially permitted. The steel forms shall be mild steel channel sections of depth equal to the thickness of the pavement. The sections shall have a length of at least 3 m except on curves of less than 45 m radius, where shorter sections may be used. When set to grade and staked in place, the maximum deviation of the top surface of any section from a straight line shall not exceed 3 mm in the vertical plane and 5 mm in the horizontal plane. The method of connection between sections shall be such that the joint formed shall be free from difference in level, play or movement in any direction. The use of bent, twisted or worn -out forms will not be permitted. At least three stake pockets for bracing pins or stakes shall be provided for each 3 m of form and the bracing and support must be ample to prevent springing of the forms under the pressure of concrete or the weight or thrust of machinery operating on the forms.

The supply of forms shall be sufficient to permit their remaining in place for 12 hours after the concrete has been placed, or longer if necessary in the opinion of the engineer.

Wooden forms - Wooden forms may be used only when specifically permitted in the drawing with the exception that their use is herein approved for all curves having radii of less than 45 m. Wooden forms shall be dressed on one side. They shall have minimum base width of 100 mm for slab thickness up to 200 mm and a minimum base width of 150 mm for slabs over 200 mm thick. Their depth shall be equal to the thickness of the pavement. These forms when used on straight shall have a minimum length of 3 m. Forms shall be held by stakes set at intervals not exceeding 2 m. Two stakes, one on each side, shall be placed at each joint. The forms shall be firmly nailed or secured to the side stakes, and securely braced at joints, where necessary, so that no movement will result from the pressure of the concrete or the impact of the tamper and during finishing work. Wooden forms shall be capped along the inside upper edge with 50 -mm angle iron well recessed and kept flush with the face of the wooden forms.

Setting of forms - The forms shall be jointed neatly and shall be set with exactness to the required grade and alignment. Both before and after the forms are placed and set the sub grade or sub -base under the forms shall be thoroughly tamped in an approved manner. Sufficient rigidity shall be obtained to support the forms in such a position that during the entire operation of compacting and finishing of concrete they shall not at any time deviate more than 3 mm from a straight edge 3 m in length. Forms, which show a variation from the required rigidity or alignment and levels shown in the drawing, shall be reset or removed, as directed. The length and number of stakes shall be such as to maintain the forms at the correct line and grad -e. All forms shall be cleaned and oiled each time before they are used. Forms shall be set for about 200m ahead of the actual placing of concrete.

11.6.7. Joints

General - The location and type of joints shall be as shown in the drawing. The edge of the slab at all joints shall be rounded off with an edging tool having a radius of 6 ± 1mm. The concrete along the face of all joints and around all tie bars and dowels shall be compacted with an internal vibrator inserted in the concrete and worked along the joint and around all tie bars and dowels to ensure a concrete free from honeycombing.

Types of joints - There are three general types of joints. These are –

(i) Expansion joint - Such joint provides the space into which pavement can expand thus relieving compressive stresses due to expansion and inhibiting any tendency towards buckling of concrete slabs.

(ii) Contraction joint - Such joint relieves tensile stresses in the concrete and prevents formation of irregular cracks due to restraint in free contraction of concrete. Contraction joints also relieve stresses due to warping.

(iii) Warping joint - Such joint relieves stresses due to warping. These are commonly used for longitudinal joints dividing the pavement into lanes.

In addition, construction joints are provided whenever construction operations require them. These are full depth joints and may belong to any of the above types.

All joints shall be carefully installed in accordance with the location and details given on the plans. The details of different types of joints are shown in Appendix B.

11.6.8. Transverse joints

General - Transverse joints can be expansion, contraction or construction joints and shall be placed as indicated on the drawing. They shall make a right angle with the centre line of the pavement and surface of the sub -base/subgrade. Contraction and expansion joints shall be continuous from edge to edge of the pavement through all lanes constructed at the same or different times.

a. Transverse expansion joints - These shall extend over the entire width of the pavement. They shall be of the dimensions and spacing as shown on the construction drawing.

Dowel bars (see Supplementary Note N. 4) as per dimensions, location and spacing shown on the drawing are required at expansion joints to transfer wheel loads to the adjacent slab. For slabs of thickness less than 150 mm no dowel bars may be provided (IS: 6509 - 1972). The pre-moulded expansion joint filler, a compressible material used to fill the gap between adjacent slabs at expansion joint shall conform to IS: 1838 -1961.

The height of the filler board shall be such that its top is 25 mm below the surface of the pavement. The dowel bars shall be held accurately in position during the placement, compaction and finishing of concrete at and near the expansion joint. This and the protection of the joint groove during construction may be achieved by means of sufficiently strong bulkheads (as per IRC: 43 -1972) with holes drilled along the centre line to accommodate the dowel bars and a mild steel section (as per IRC - 43 -1972) respectively. The latter shall be oiled or greased before placing in position to avoid bonding with concrete. The top and bottom edges of the bulkheads and mild steel section shall be shaped to correspond to the camber of the pavement at the joint. If considered convenient, two -piece split bulkheads may also be used. When dowel bars are provided, bulkheads shall be used in pairs, one at the joint location, and the other some distance away to hold the projecting ends of the dowel bars to maintain their alignment. For cases where dowel bars are not provided, one single bulkhead without holes will be adequate.

The bulkheads shall be securely staked in place at right angles to the centre line and surface of the pavement with sufficient stakes to hold them in the specified position.

After the concrete has sufficiently hardened the mild steel metal section shall be removed carefully without disturbing the edges. The edges shall then be rounded with an edging tool. For facilitating removal of the mild steel section as well as edging operation, the top of the section may be flared on both sides with the required curvature of a rounded edge.

Under no circumstances shall any concrete be left above the expansion 'joint filler or across the joint at any point. Any concrete spanning the ends of the joint next to the forms shall be carefully cut away after the forms are removed.

b. Transverse contraction joints - These shall be placed as shown on the drawing and shall be of the weakened plane or "dummy" groove type. They shall be constructed by forming in the surface of the slab a slot not less than 6 mm wide and having a depth equal to one -third to one -fourth the depth of the pavement at the thinnest part of its section. This slot may be formed in a manner approved by the engineer such as by pushing into the concrete a flat bar or the web of a "T" bar using a suitable vibratory device, removing the bar, and keeping the slot open. It shall be ensured that no spalling of concrete occurs while removing the bar. The edges of the joint shall be rounded with an edging tool before the concrete hardens.

c. Transverse construction joints - These shall be placed whenever placing of concrete is suspended for more than 30 minutes. Excepting in the case of emergency, construction shall always be suspended at the regular site of expansion or contraction joints. If the construction joint is located at the site of an expansion joint, regular expansion joint shall be provided; if at the site of a contraction joint or otherwise, the construction joint shall be of butt type with dowels.

At all construction joints, bulkhead shall be used to retain the concrete and care shall be taken in striking off and finishing the surface to the top face of the bulkhead. When work is resumed, the surface of concrete laid subsequently, shall conform to the grade and cross -section of previously laid pavement, and a straight edge 3m in length shall be used parallel to the centre line, to check any deviation in the surface of the two sections. Any deviation from the general surface in excess of 3 mm shall be corrected.

11.6.9. Longitudinal joints

These shall be of the plain butt type and shall be formed by placing the concrete against the face of the slab concreted earlier. The face of the slab concreted earlier, shall be painted with bitumen before placing of fresh concrete.

Tie bars shall be used at longitudinal joints and they shall be of the dimensions and at spacing shown in the construction drawing. Tie bars shall be supported so as not to be displaced during construction operations. Tie bars shall be bonded in the slabs across longitudinal joints, and whilst casting the first slabs, they may be bent so that one end of them lies along the forms. After removal of the forms, bars shall be straightened so that they extend into the concrete placed on the other side of the joint.

11.6.10. Construction

a. Storage and handling of cement

Cement shall not be stored for a long time and should be used normally within six months of its date of receipt. Even during this period of storage it is essential that cement shall be protected from moisture by storing it in suitable sheds. Storage shed with a concrete floor laid on a well -drained foundation may be satisfactory. Cement in bags shall be stored on boards raised above the floor level for the purpose of ventilation, and the bags shall not touch the walls of the shed. Different consignments should be separately stacked and used in order in which they have been received. When bulk supply cement is used, special storage facilities such as covered hopper bins will be required. Supply of cement should be co-coordinated with its consumption so that it is not stored right through the rainy season, when normally concreting is discontinued. Cement having lumps which have been caused due to improper storage or by pressure due to over -loading of bags shall not be considered for use unless these lumps can be easily powdered with pressure between fingers. Before such cement is used, representative sample containing also the lumps in fair proportion shall be taken and tested as per IS - 269 -1976, 8112 -1976, 1489 -1976, 455 -1967 or 8041E -1976 as the case my be, to fulfill the minimum requirements.

b. Storage and handling of aggregates

The location and preparation of sites, minimum size of stack and the methods adopted for dumping and stacking to prevent segregation of coarse and fine material shall be subject to the approval of the engineer. Aggregates from different sources and/or of different grading shall not be stacked together. Each separate size of coarse aggregate shall be stacked separately. The storing of aggregates upon the carriageway or shoulders shall not be permitted.

If aggregates are stored in conical stacks, segregation will be increased by the rolling of the coarser particles down the sides of the stacks. To avoid this, stacks should be built up in approximately horizontal layers. Dry fine aggregate segregates and gets blown away easily it may be helpful to moisten it. To assist in controlling the water/cement ratio, large fluctuations in the moisture content of aggregates may be reduced by storing the bulk of the material well in advance of use. For this purpose, all washed aggregates shall be stacked for draining at least 12 hours before being batched. It is also a good practice to reserve the bottom 150 -300 mm or so of the stacks as a drainage layer. Where this cannot be done, the aggregates should not be placed on the ground. In such case, somewhat raised planks, metal sheets or concrete base should be provided and laid to slopes.

The aggregates shall be handled from the stacks and fed into the mixer in such a manner as to secure the stipulated grading of the material. Aggregates that have become mixed with earth or other foreign material shall not be used. They shall be washed clean before use.

c. Batching of materials

All batching of materials shall be by weight or volume as approved by the Engineer. the proportion of ingredients shall be as specified in the item of work in Bill of Quantities, The Engineer may permit the use of fractional bags of cement provided they are accurately weighed and are handled in a manner meeting with his approval. Water may be measured by volume. It should, however, be borne in mind that weigh batching is definitely much more desirable than volume batching. If batching by volume is permitted, as a special case, separate measuring boxes shall be provided for the different aggregates. The boxes shall be of strong construction provided with handles for convenient lifting and loading into the mixer. They shall be of such size that it should be possible to measure out the requisite quantity of aggregate per batch in whole box or by multiples thereof and capable of being lifted by two men. Each box shall be provided with a straight edge of required length for striking off after filling. If so directed by the engineer, improved facilities such as tipping boxes of accurate capacity working on run -out rails arranged for direct delivery into the hopper of the mixer shall be provided by the construction agency. In volume batching, suitable allowance shall be made for the hulking of fine aggregate due to the presence of water. For this purpose the bulking shall be determined as per relevant Indian Standard Specification.

d. Mixing

General - The mixing of concrete shall be done in a batch mixer of approved type, which will ensure a uniform distribution of materials throughout the mass, so that the mix is uniform in colour and homogeneous. All concrete shall be mixed in quantities for immediate use.

The mixer shall be equipped with approved water -measuring device capable of accurate measurement of water required per batch. The mixer shall preferably be equipped with a mechanically operated pump for filling the mixer tank.

The mixer, if so specified, shall be equipped with an approved timing device which will automatically lock the discharge lever during the full time of mixing and release it at the end of the mixing period; the device shall also be equipped with a ball, adjusted to ring each time the lock is released. If the timing device gets broken, the mixer will be permitted to be used while the same is being repaired, provided an approved time -piece equipped with minute and second bands is provided. Each batch shall be mixed for at least one and a half minutes. Spilling of the materials at either end of the mixer shall be corrected by reducing the size of the batch and in no case shall the volume of the mixed material per batch exceed the manufacturers guaranteed capacity of the mixer. The type, size and number of mixers shall be so chosen as to provide the required output without overloading. The mixing speed of the drum shall not be less than 15 revolutions per minute nor the peripheral speed of the drum greater than 60 m per minute. The batch of cement, fine aggregate and coarse aggregate shall be fed into the mixer simultaneously with the water being introduced either at the same time or before the dry materials. The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch.

The skip shall be so maintained and operated that each batch will be completely discharged into the mixing drum at the loading of the mixer. The mixer shall be cleaned at suitable intervals while in use.

Pick -up and throw -over blades in the drum of the miner which are worn down 20 mm or more in depth shall be replaced with new blades.

(i). Time of mixing - The mixing of each batch will continue not less than one and half minute after all the materials are discharged into the mixer.

(ii). Re-tempering - The re-tempering of concrete i.e. remixing with or without additional cement, aggregate or water shall not be permitted.

11.6.11. Control of workability and strength

a. Workability of concrete - The workability of concrete shall be checked by performing "slump test" or "compacting factor test" in accordance with IS ; 1199 -1959 “Method of Sampling and Analysis of Concrete." The frequency of testing shall be one test per 10 m3 of concrete and the permissible tolerances from the specified value for workability shall be -

Slump	± 12 mm
Compacting factor	± 0.03

Where variations beyond the permitted tolerances are observed, necessary adjustment shall be made keeping the water cement ratio same.

b. Strength of concrete - The strength of concrete shall be determined either by compressive or flexural strength tests (preferably the latter, since concrete pavements are designed on the basis of flexural strength of concrete) depending on the facilities available. For this purpose, during the progress of the work, cube/beam samples shall be cast for testing at 7 and 28 days. Sampling and testing shall be done in accordance with IS - 1199 -1959 “Method of Sampling and Analysis of Concrete" and IS - 516 -1959 "Method of Test for Strength of Concrete" respectively. The minimum frequency of samples shall be 3 cube/beam samples for each age of 7 and 28 days for every 30 m3 of concrete.

On a paving job, the strength of concrete should be continuously monitored to ensure that the desired strength is achieved. In certain - cases, because of change in the source of cement or control or climatic factors, the strength may show some variations, which would require re -designing of the mix.

11.6.12. Transporting and placing of concrete - The concrete shall be mixed in quantities required for immediate use and shall be deposited on the sub -base to the required depth and width of the pavement section, in successive batches and in continuous operation without the use of intermediate forms or bulk -heads between joints. Care shall be taken to see that no segregation of materials results whilst the concrete is being transported from the mixer to the place where it is deposited. The usual method of transport of concrete in India is in pans as head loads or in small wheel barrows. The spreading shall be as uniform as possible to avoid re-handling of the concrete. Where, however, a certain amount of re -distribution is necessary, it shall be done with shovels and not with rakes. While being placed, the concrete shall be tamped with suitable tools for slab thicknesses of 12.5 cm and less so that formation of voids or honeycomb pockets is prevented. The concrete shall be particularly well placed and tapped against the forms and along all joints, For higher thicknesses an internal vibrator shall be employed in lieu of rodding of the concrete. To effect adequate compaction, the concrete shall be placed with appropriate surcharge over the final slab thickness. The amount of surcharge will depend on the mode of placement of concrete and shall be determined by trial. In general, the required surcharge is about 20 per cent of the required slab thickness. Any portion of the batch of concrete that becomes segregated while depositing it on sub-grade shall be thoroughly mixed with the main body of the batch during the process of spreading. In case of unavoidable interruption, a full depth transverse joint shall be made at the point of stoppage of work provided the section on which the work has been suspended is about 2 to 3 hours long. In placing of concrete for two course construction, necessitated by either positioning of the reinforcement, a richer mix for the wearing surface, or when thickness of the concrete is beyond

20 cm, the bottom layer of concrete shall be struck off to the required levels by a vibrating screed working on the side forms with notches corresponding to the depth of the top course of concrete.

The vibrating screed should have a vibrating unit mounted on it similar to that of the screed used for compaction of the final surface of concrete. The time lag between laying of the two courses shall not exceed the initial setting time of cement.

11.6.13. Placement of steel

a. Reinforcement - Reinforcing steel shall be free from dirt, scale or other foreign matter and rust of such degree or development as to impair bond of the steel with the concrete. The width of fabric sheets or bar mats shall be such that when properly placed into the work the extreme longitudinal bars or wires of the sheets or mats will be located not less than 50 mm and not more than 100 mm from the edges of the slab. Except for dummy joints, the length of fabric sheets or bar mats shall be such that when properly placed into the work, the reinforcement will be clear of transverse joints by not less than 50 mm and not more than 100 mm as measured from the centre of the Joint to the ends of longitudinal bars or wires of the sheet or mat.

While overlapping the sheets or mats in either direction, the overlap shall be at least equal to the spacing between the bars or wires in the respective direction or 40 times the diameter of the bar or wire, whichever is more.

Whilst using reinforcement in one layer, the concrete shall be placed in two stages. The initial layer shall be uniformly struck off to a depth corresponding to the reinforcement shown in the drawings and lightly compacted by a screed to obtain uniform levels. The reinforcing fabric sheet or bar mat shall then be placed on the compacted layer of concrete and remaining depth shall be filled in with concrete thereafter.

In doing this operation, the initial layer of concrete shall be struck off to the entire width of the slabs and of sufficient length to permit sheet or mat of reinforcement to be laid full length without further manipulations of the reinforcement. Displacement of the reinforcement during concreting operations shall be prevented.

b. Load transfer devices - dowels - Transverse expansion joints shall be equipped with dowels of the dimension and at the spacing and location indicated on the drawing. They shall be firmly supported in place, accurately aligned parallel to the sub-grade/sub -base, parallel to each other and parallel to the centre line of the pavement, by means of appropriate dowel supports. The dowel supports shall ensure that the dowels are not displaced during construction. The permissible tolerances in dowel bar alignment in both vertical and horizontal directions shall be ±1 mm in 100 mm for dowels of 20 mm and smaller diameters and ±0.5 mm in 100 mm for. dowels of diameter greater than 20 mm. One -half of each dowel shall be painted with a thin film of bitumen and equipped with a tight fitting metal sleeve of the dimensions shown on the drawing to provide space for the dowel when pavement expands and the join closes. This sleeve shall be partly filled with cotton waste to prevent it being pushed too far on the dowel during construction.

These sleeves are not required on dowels, if used, in dummy contraction or construction joints.

c. Tie bars - Tie bars provided in longitudinal joints of plain butt type to prevent opening of such joints shall be bonded to the adjacent slabs on both sides of the longitudinal joint. They are installed by providing appropriate (drilled) holes in the side forms depending on the size and spacing of bars. They are bent aside temporarily to avoid obstruction to construction traffic and straightened later at the time of laying of slab in the adjacent lane.

11.6.14. Compaction and finishing

11.6.14.1 Compaction - The pavement shall be compacted either by means of a power-driven pavers-cum -finisher or by a vibrating screed along with internal vibrators where the slab thickness is more than 12.5 cm. For lesser thicknesses vibrating screed may be supplemented with manual rodding. For areas where the width of the slab is very small as at the corner of street junctions, etc. compaction with wooden hand tampers may be adopted subject to the approval of the engineer. In no case, however, hand compaction shall be permitted for slab thicknesses beyond 10 cm. All compaction shall be done in accordance with the following requirements –

(i) Where hand tamping is permitted as a special case –

(i) Concrete with surcharge, as soon as placed, shall be struck off uniformly and screeded, to such level above the base that when compacted and finished, the pavement shall conform to the grade and cross -section indicated by the plans. The entire surface shall then be tamped and the tamping operation continued until a close knit dense surface is obtained.

(ii) The tamper shall rest on the side forms and shall be drawn ahead with a sawing motion, in combination with a series of lifts and drops alternating with lateral shifts, the aim of this operation being compaction and screeding to the approximate level required. Subsequent tamping should advance about 75 mm at a time in the direction in which the work is proceeding, and in the final stages tamping should be closer, about 12 mm at a time until a level and dense surface is obtained.

(iii) Segregated particles of coarse aggregate which collect in front of the tamper or screed shall be thrown outside the forms or thoroughly mixed by hand with the un compacted mass of concrete already placed. Under no circumstances shall such segregate particles be carried forward and pushed on to the base in front of the mass.

(iv) Compaction by tamping or screeding shall be carried on till the mortar in the mix just works up to the surface. Care shall be exercised and the operation of tamping so controlled as to prevent an excess of mortar and water from being worked on to the top. Repeated operation other than to secure the necessary compaction and to eliminate voids shall be avoided.

(v) Immediately after the tamping or screeding has been completed and before the concrete has hardened, While the concrete is still in a plastic stage, the surface shall be inspected for irregularities with a profile checking template and any needed correction made by adding or removing concrete followed by further compaction and finishing.

11.6.14.2. Floating - As soon as practicable after the concrete has been compacted, its surface shall be smoothened by means of a longitudinal float, operated from a foot -bridge. The longitudinal float shall be worked with a sawing motion, while held in a floating position parallel to the carriageway centre line and passed gradually from one side of the pavement to the other. Movements ahead along the centre line of the carriageway shall be in successive advances of not more than one half the length of the float.

11.6.14.3. Straight-edging - After the longitudinal floating has been completed and excess water has disappeared, but while the concrete is still plastic, the slab surface shall be tested for trueness with a 3 m straight edge. The straight edge shall be held in successive positions parallel to the road centre line in contact with the surface and the whole area gone over from one side of the slab to the other. Advance along the road shall be in successive stages of not more than one -half length of the straight edge. Any area of depression found shall be scooped to a depth of 4 -5 cm, filled immediately with freshly mixed concrete, struck, compacted, and re-finished. High areas shall be cut down and refinished. The straight edging and re-floating shall continue until the entire surface is found to be free from observable departures from the straight edge and the slab has the required grade and camber.

The slab surface shall be retested for trueness, before the concrete begins to set, with the 3 m long master straight edge and the graduated wedge gauge.

The straight edge shall be placed on the surface in successive positions, parallel to the carriageway centre line. Irregularities shall be measured with the help of the wedge gauge moved transversely at various points until it touches both the straight edge and the concrete surface.

At any point tested the concrete shall not show a departure greater than 3 mm from the true surface. If at any place the departure exceeds this value not more than 3 passes of the vibrating screed shall be allowed and the surface tested again in the specified manner. If the irregularity still exceeds the limit aforesaid, the concrete shall be removed to a depth of 50 mm or up to the top surface of the reinforcement, if any. The area of concrete to be removed shall be demarcated by the length of the straight edge in the position of measurement across the full width of the slab. Where the point of measurement in default is less than 4.5m from the nearest transverse expansion joint, the whole area upto the joint shall be removed to the required depth. The concrete so removed shall not be re -used in the carriageway. Fresh concrete shall be placed, compacted and finished in the manner already described in these specifications and shall again be subject to test for accuracy of finish.

The foregoing procedure shall be adopted at each shifting of the straight edge and the whole area shall be gone over from one side of the slab to the other. The straight edge shall advance longitudinally in successive stages of not more than one -half the length of the straight edge.

No extra payment shall be made for the removal of the rejected concrete and or laying fresh concrete.

Although the concrete may be removed immediately following measurement of the irregularity and while it is still wet, this shall not mean any waiver from complying with the requirements of this clause, if for any reason the concrete to be removed has already hardened.

After straight edging of the surface, it shall be finished by brooming in the manner described as mentioned in the following paragraphs.

11.6.14.4. Brooming - After belting and as soon as surplus water if any has risen to the surface, the pavement shall be given a broom finish with an approved long handled steel or fiber broom conforming to the stipulations laid down in JRC - 43 -1972. The broom shall be pulled gently over the surface of the pavement from edge to edge. Adjacent strokes shall be slightly overlapped. Brooming shall be' perpendicular to the centre line of the pavement and so executed that the corrugations thus produced will be uniform in character and width, and about 5mm deep. Brooming shall be completed before the concrete reaches such a stage that the surface is likely to be torn or unduly roughened by the operation. The broomed surface shall be free from porous or rough spots, irregularities, depressions and small pockets, such as may be caused by accidentally disturbing the particles of coarse aggregate embedded near the surface.

11.6.15. Curing of concrete - Immediately after the finishing operations have been completed the entire surface of the newly laid concrete shall be covered against rapid drying, and cured. Failure to provide sufficient cover material of the stipulated type or inadequate supplies of water for curing shall be adequate cause for immediate suspension of concreting operations.

11.6.15.1. Initial curing - After completion of the finishing operations, the surface of the pavement shall be entirely covered with wet hessian cloth, burlap or jute mats. The coverings used shall be of such length (or width) that when laid will extend at least 500 mm beyond the edges of the slab, shall be so placed that the entire surface and both the edges of the slab are completely covered. They shall be placed as soon as the concrete has set sufficiently to prevent marring of the surface. Prior to their being placed, the coverings shall be thoroughly wetted with water and placed with the wettest side down. They shall be so weighed down as to cause them to remain in intimate contact with the surface covered. They shall be maintained fully wetted and in position for 24 hours after the concrete has been placed, or until the concrete is sufficiently hard to be walked upon without suffering any damage. To maintain the coverings wet, water shall be gently sprayed so as to avoid damage to the fresh concrete. If it becomes necessary to remove the coverings for any reason, the concrete slab shall not be kept exposed for a period of more than half an hour.

Worn coverings or coverings with holes shall not be permitted. Coverings reclaimed from previous use other than curing concrete shall be thoroughly washed prior to use 'for curing purposes, if the covering is furnished in strips, the strips shall be laid to overlap at least 150 mm.

Covering shall be placed from suitable wooden bridges (IRC -43 - 1972). Walking on freshly laid concrete to facilitate placing coverings shall not be permitted.

11.6.15.2. Final curing - Upon the removal of the covering the slab shall be thoroughly wetted and then cured by one of the following methods of final curing -

(a) Curing with wet earth - Exposed edges of the slab shall be banked with a substantial berm of earth. Upon the slab shall then be laid a system of transverse and longitudinal dykes of clay about 50 mm high, covered with a blanket of sandy soil free from stones to prevent the drying up and cracking of clay. The rest of the slab shall then be covered with sufficient sandy soil so as to produce a blanket of earth not less than 40 mm depth after wetting. The earth covering shall be thoroughly wetted while it is being placed on the surface and against the sides of the slab and kept thoroughly saturated with water for 14 days and thoroughly wetted down during the morning of the 15th day and shall thereafter remain in place until the concrete has attained the required strength and permission is given to open the pavement to traffic. When such permission is granted, the covering shall be removed and the pavement swept clean. If the earth covering becomes displaced during the curing period, it shall be replaced to the original depth and re -saturated,

11.6.16. Removing forms - Forms shall not be removed from freshly placed concrete until it has set, or at least 12 hours, whichever is later. They shall be carefully removed in such a manner that no damage is done to the edges of the pavement. After the forms have been removed, the slab edges shall be cleaned and any limited honey -

combed areas pointed up with 1 -2 cement sand mortar, after which the sides of the slab shall be covered with earth to the level of the top of the slab for final curing Slabs with excessive honey -combing as a result of inadequate compaction shall be removed between nearest transverse joints.

11.6.17. Concreting during monsoon months - When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulins or other waterproof cloth shall be provided along the line of work. Any time when it rains, all freshly laid concrete, which has not been covered for curing purposes, shall be adequately protected by means of tarpaulins or other waterproof cloth. Any concrete damaged by rain shall be removed and replaced.

11.6.18. Concreting in hot weather - As placing of concrete in air temperatures above 40°C, or above 35°C combined with relative humidity below 25 percent and/or wind velocity higher than 10 km/hour, is attended with defects like loss of workability through accelerated setting, formation of plastic shrinkage cracks, etc., it is recommended that unless adequate precautions are taken, no concreting shall be done in conditions more severe than the above. The procedures recommended for adoption in case of hot weather concreting is given in IRC - 61 -1976 “Tentative Guidelines for the Construction of Cement Concrete Pavements in Hot Weather." Brief details of the procedure are given below -Aggregates, cement and water shall be protected from the direct sun and mixing operations shall also be carried out in shade. In addition portable shelters shall be provided to protect the concrete during placing and finishing operations. This may be in the form of gable frames to cover the full length of the concrete pavement laid in a day. The surfaces of the formwork and subgrade coming in contact with concrete shall be moistened prior to placing of the concrete to prevent absorption of mixing water.

Since the setting time of concrete is considerably reduced under such temperatures, labour force shall be reinforced to minimise the time between mixing and placing of concrete. The protective cover shall be adequate to exclude exposure of the concrete directly to the sun and also eliminate contact with drying winds. Prior to removal of the portable shelters, the hardened concrete shall be covered with wet hessian or burlap or the like followed by one of the usual methods of curing like ponding, etc. In addition, the moist curing period shall be extended to 4 weeks.

11.6.19. Work on gradients - The progress on gradient of all operations of placing, compacting and finishing of concrete should proceed from the lower to the higher reaches. The concrete mix shall be stiffer than that used on level reaches.

11.6.20. Protection of concrete - Suitable barricades shall be erected and maintained and watchmen employed to exclude traffic from the newly constructed pavement for the period herein prescribed, and these barriers shall be so arranged as not in any way to interfere with or impede traffic on any lane intended to be kept open and necessary signs and lights shall be maintained clearly indicating any lanes open to the traffic. Where, as shown on the plans or indicated in the special provisions, it is necessary to provide for traffic across the pavement, suitable and substantial crossings to bridge over the concrete shall have to be provided. Such crossings, as constructed, shall be adequate for the traffic and approved by the Engineer.

Any part of the pavement damaged by traffic or other causes occurring prior to its final acceptance shall be repaired or replaced in a manner satisfactory to the Engineer. The pavement shall be protected against all traffic usage including that of construction -traffic.

11.6.21. Sealing of joints - After the curing period is over and before the pavement is opened to traffic, the temporary seal and all other intruded materials in the transverse expansion and contraction joints as well as longitudinal joints shall be removed completely and the groove; filled with the approved joint sealing compound as per IRC - 57 -1974 "Recommended Practice for Sealing of Joints in Concrete Pavements”. The joint opening shall be thoroughly cleared of all foreign matter before the primer followed by sealing material is placed. If necessary, the foreign matter shall be blown out by compressed air pressure. All contact faces of the joint shall be cleaned with a wire brush to remove loose material and shall be surface dried before the primer is applied.

11.6.22. Opening to traffic - In general, traffic shall be excluded from the newly constructed pavement for a period of 28 days where Ordinary Portland Cement, Portland Blast Furnace Slag Cement and Portland Pozzolona Cement are used, or for a period of 7 days where Rapid Hardening Cement is used. In all cases, before the pavement is opened to traffic it shall be cleaned and the joints shall be sealed.

12.0 General Civil Specifications:

The following civil specifications shall be applicable for providing and executing all such items which are not mentioned in foregoing paras but are necessary to be provided and for the items in bill of quantities which are mentioned above but require some elaboration. No extra cost shall be paid for such items. It should clearly be understood by the Contractors / tendering firms that all civil specifications mentioned here below shall be treated as part of the technical specifications already mentioned. The specific requirement of different items of work involved in the construction, completion and commissioning of the system as a whole, shall be provided in accordance with the requirement given in these civil specifications.

12.1. Site Clearance

Before taking up construction, site shall be cleared of all jungles, bushes and unwanted vegetation growth. After completion of plant, the entire site area shall be cleared of all left over material and debris. The work shall be carried out in accordance with the specifications in bill of quantities and payment shall be as per quoted rates for the respective items.

12.2. Sections for excavation for all underground structures and pipe lines

Contractor shall prepare sectional drawings showing the details of excavation for all underground structures and pipe lines, in all kinds of soils, boulders, soft and hard rock etc., based on test results of soil testing and investigation reports complying to specifications in clause 2.0 to 2.15 for earthwork excavations and shall submit to the Engineer for review and approval, prior to starting of the work. If during excavation any change in section is considered necessary for reasons of safety of workers, the Engineer will issue directions for compliance by the Contractor. The Contractor shall comply with the Engineer’s directions without any extra charge or payment.

12.3. Form Work

Formwork, shuttering, centering, scaffolding etc., shall be of steel plates or plywood, lined with MS-sheets and for scaffolding steel tubular shall be used. Joints should be sufficiently tied to prevent loss of cement slurry from the concrete. All forms, shuttering shall be levelled, aligned, and thoroughly cleaned, before they are used for concreting. Formwork shall be removed after specified days of curing with the prior written permission of the Engineer. The surface of RCC after removal of formwork / shuttering shall be smooth and even and without honeycombing or undulations.

12.4. Procedure and Materials used in concrete works.

The procedure for concrete works shall be in accordance with the specifications in the bill of quantities, specifications in this section and complying to standard practices in IS:456-2000 with latest amendments, all concrete works shall be executed in accordance with standard practices, including volumetric batching using boxes of standard size, concrete mixers with hopper, compaction using vibrators and according to the directions of the Engineer In-charge of works.

12.4.1. Aggregates.

All aggregates, fine and course used in concreting works shall comply to the standards laid down in IS: 456-2000 with latest amendments and specifications in applicable clauses in this section.

12.4.2. Water.

The water used in all concreting works shall be of potable quality and tested before usage in the construction works and shall be confirming to IS: 456-2000.

12.4.3. Cement.

The cement used shall be of sulphate resisting cement confirming to IS: 12330 as specified and where ever the concrete is coming in contact with sewage. For other concreting works like encasing pipe, pedestals and other structures where there is no contact with sewage, it shall be OPC confirming to IS:8112 with latest amendments and revisions.

12.5. Minimum clear cover over Reinforcement

Minimum clear cover over the steel reinforcement shall be 50mm for the members contact with soil/ground water. For other faces the clear cover over the reinforcement shall be as per latest IS Codes.

12.6. Tested Steel

Only tested and approved steel shall be used for reinforcement in RCC works, and the Contractor shall produce the test certificates to the

Engineer. The type of steel used shall be of TMT of grade of steel Fe: 500 confirming to relevant IS.

12.7. Restoration of Storm water drains & other Miscellaneous works.

The storm water drains and cover slabs damaged during execution of works which is not due to the negligence of the contractor as decided by the Engineer shall be restored as per the items in bill of quantities. The specifications in this section are deemed to govern the applicable items in the bill of quantities. All masonry works, concrete works shall be in accordance with relevant IS as mentioned in clause 1.2.6. of this section and or as directed by the Engineer. Other repairs works under heading “Miscellaneous works” in bill of quantities shall be executed in accordance with the specifications and as directed by the Engineer, the finished item of work shall give neat appearance and should serve the intended purpose of the component to the satisfaction of the Engineer.

12.8. Disposal of night soil.

The night soil from the existing soak pits shall be cleared and desilted by the bidder including backfilling of the pits to required compaction, handling, salvaging and disposal of night soil /sludge. A suitable site should be identified by the Contractor & approver by the Engineer, for safe disposal of sewage /silt / sludge removed (preferably approved sludge disposal sites of STPs), excavations at the pumping / lifting station sites, which should be away from the water bodies, residential & sensitive areas, agricultural areas and etc. The costs towards removing handling & disposal of night soil / sludge shall be borne by the contractor & is deemed to be included in the quoted offer of the Bidder. If required & certified by the Engineer, sewer cleaning machine will be provided free of cost, for sucking the sewage from soak pit, As soon as the work at the soak pit is completed the pit shall be filled with earth in layers not exceeding 15 cm, each layer shall be watered, rammed & properly consolidated before the succeeding one is laid. Each layer shall be consolidated to the required standard specification. The final backfill surface shall be trimmed & levelled as directed by the Engineer in charge.

13.0 TRAINING AFTER COMMISSIONING & DEFECT LIABILITY PERIOD : NA

13.2. TRIAL RUN OF THE SYSTEM

After commissioning of works, the contractor shall maintain the works for 3 (three) months to demonstrate satisfactory performance to the Engineer prior to taking over by the Employer. The cost of electricity, if required for operation & maintenance of works during the period of this trial run will be borne by the Employer. The cost towards Contractors Engineer and other operating personnel during the said period of trial run, along with cost of tools and spare parts which are required for operation and maintenance of the works and equipment during the trial run period shall be borne by the Contractor and shall be included in the quoted bid price. In the event that the system or any of the facilities do not satisfactorily achieve the required performance standards during this period, the trial run period shall be extended until such time as the Contractor has satisfactorily rectified any deficiencies as may be necessary to satisfy the performance requirements. No additional compensation will be paid to the Contractor for such extension.

13.3. DEFECTS LIABILITY PERIOD

During 12 month Defects Liability period, the Contractor has to set right the defects of any kind in the manufacture, laying and jointing of sewer lines and its appurtenants works, other civil and mechanical works in his scope including replacement of defective items, labour and technical services if required and also making good the restored road surface as mentioned above in case of settlement. Contractor shall be responsible to monitor and ensure the successful performance of the system throughout the Defects Liability Period, and shall be responsible to ensure that the Employer's Personnel are provided with on-the-job training as may be necessary to ensure uninterrupted satisfactory Performance of the system and facilities by the Employer's Personnel after completion of the contract Period

SECTION 8:
BILL OF QUANTITIES

Rate (Rs)						
Sl. No.	Description of item (with brief specification and reference to Book of specification)	Quantity	Unit	In figures	In words	Amount (Rs)
Total Tender Price (in figures)						
(in words)						

Note:

(1) Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities [*refer: ITB Clause 11.2 and CC Clause 37.2*].

(2) Unit rates and prices shall be quoted by the Tenderer in Indian Rupees.

(3) Where there is a discrepancy between the rate in figures and words, the lower of the two will govern. [*ITT Clause 24.1(a)]*

(4) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern [*ITT Clause 24.1 (b*)]

SECTION 9 :
SECTION 9: FORMAT OF BANK GUARANTEE FOR SECURITY DEPOSIT

To: ______________________________________ [name of Employer]
__________________________________ [address of Employer]

WHEREAS _________________________ [name and address of Contractor] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated ________________ to execute __________________________ [name of Contract and brief description of Works] (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;
AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Rs.____________________ [amount of guarantee]
[29]_Rupees__________________________ __________________________[in words], and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of ____________________ [amount of guarantee]30 as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 30 days from the date of expiry of the Defects Liability Period.

Signature and seal of the guarantor

____
Name of Bank ___________________________
Address ____
Date ______________________________________

SECTION 10 :
Drawing